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JOHNSON (E. M.) & VALLEAU (W. D.). **Blackleg of Tobacco seedlings.**—*Phytopath.*, xxi, 10, pp. 973–978, 5 figs., 1931.

In May, 1930, Burley tobacco seedlings at the transplanting stage were found in Kentucky to be suffering from a rot starting at or near soil level and extending up the stem. The rotted areas were brown or almost black, sometimes soft, and the stems were often split longitudinally, the basal leaves being partially or entirely decayed. Numerous actively motile bacteria occurred in the rotted parts and were readily isolated. Inoculations on Turkish and Burley tobacco in the greenhouse and field gave positive results. Soft rot of potatoes and carrots was also produced by the tobacco blackleg pathogen, comparative studies of which with *Bacillus aroideae* and *B. carotovorus* indicate a close relationship with the former, with which it is considered to be probably identical.

ANGELL (H. R.) & HILL (A. V.). **Blue mould of Tobacco: longevity of conidia.**—*Journ. Australia Council Sci. & Indus. Res.*, iv, 3, pp. 181–184, 1931.

Experiments [which are described and the results of which are tabulated and discussed] showed that the conidia of the *Peronospora* causing downy mildew or blue mould of tobacco [*R.A.M.*, xi, p. 198] remained viable not only for five weeks over fused calcium chloride in desiccators but also for two months either in the cool, moist air of a refrigerator or buried in cool, dry soil.

As conditions may exist in nature which allow of similarly long life to the conidia of this organism, it is considered that the disease may be capable of spreading over larger areas than has hitherto been thought likely. Such a possibility emphasizes the necessity of destroying diseased plants, and at the end of the season ploughing under the remains of the crop, keeping the field free from volunteer plants in the spring before the new crop is planted.

MCCLEAN (A. P. D.). **Bunchy top disease of the Tomato.**—*Farming in South Africa*, vi, 67, pp. 275–276, 280, 5 figs., 1931.

Bunchy top disease of tomatoes has been observed since 1926 in South Africa, causing extreme reduction in the size of the plants, which reach a height of only 1 to 2 ft. The leaves are abnormally

small and unusually dark in colour, the new ones being closely grouped at the top of the plant; the affected foliage is further characterized by downward curling of the margins and an uneven surface. The older leaves at the base of the plant die off from fungous diseases, e.g., leaf spot [*Septoria lycopersici*]. In advanced stages of bunchy top only a few thin, erect stems with small leaves are left. Affected tomato plants bear no fruit of any commercial value.

The tomato bunchy top virus is believed to be similar to that of tobacco mosaic, and is also transmissible by handling, use of infected tools, and the like. No evidence has been obtained of seed or soil transmission. Diseased plants in old fields, and possibly weeds, seem to constitute the primary sources of infection; Cape gooseberries [*Physalis peruviana*] are very susceptible. Early cases of bunchy top may be observed five weeks after transplanting. Occasionally the disease occurs in epidemic form, but usually its incidence is low. In addition to cultural measures and the roguing of diseased plants, the use of an insecticide, such as lime-sulphur and lead arsenate, in the seed-bed is recommended.

SHAPOVALOV (M.). **Graft transmissions of curly top in Tomatoes (Tomato yellows.)**—Abs. in *Phytopath.*, xxi, 10, pp. 998–999, 1931.

Young, healthy tomato seedlings, grown in pots in the greenhouse at Berkeley, California, were inoculated with yellows [*R.A.M.*, x, p. 415] by a week's exposure of one leaf of each plant to viruliferous beet leafhoppers, *Eutettix tenella*. The inoculated plants were then grafted with healthy plants of the same age, and some were shaded. On an average a higher number of successful transmissions was obtained by inoculation with viruliferous insects than grafting, except when this operation was performed immediately after the removal of the leafhoppers. The exposure of inoculated and grafted plants to four or six hours' artificial illumination by four 500-watt Mazda lamps during the evening accelerated the rate of disease development, which was retarded by muslin shading.

FENNER (L. M.). **Bacterial canker of Tomato and its distribution with the seed from infected fruit.**—*Journ. Econ. Entom.*, xxiv, 2, pp. 544–547, 1931.

After a brief description of the symptoms and notes on the economic importance of bacterial canker of tomatoes (*Aplanobacter michiganense*) [*R.A.M.*, x, p. 415], the writer gives a short account of an experiment conducted in 1930 to determine the extent of seed contamination within a given fruit of a plant with systemic infection.

Tomato seed from cankered and healthy plants was saved from Mississippi fields. A part of the fruit was washed to remove the débris and the remainder first washed and then immersed for five minutes in 1 in 1,000 bichloride of mercury for the purpose of eliminating surface contamination. The seeds were removed aseptically with a knife and spatula. An examination of the external and internal appearance of the seed of 68 fruits of

Mississippi plants showed less than 2 per cent. infection, though 75 per cent. of the fruits showed some infection, while seed produced elsewhere showed a trace to above 1 per cent. In one case two fruits from an apparently healthy plant in a cankered field yielded infected seed. The actual contamination in these seed lots from various sources is estimated at 10 per cent. and above, and it is pointed out that the fermentation method of saving tomato seed favours contamination. The preliminary experiments show that a small amount of infected seed may give rise to a fairly high percentage of diseased plants, while contaminated seed usually results in a very high proportion of infected plants.

SMALL (T.). **Experiments on the control of Tomato leaf mould (Cladosporium fulvum) by fungicides and fumigants.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 305-312, 1931.

The results of laboratory and greenhouse experiments [brief details of which are given] on the control of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, x, p. 630] at the Experiment and Research Station, Cheshunt, showed that most of the fungicidal sprays tested were more efficient when agral I was added as a spreader instead of saponin. Effective control was afforded by 0·25 per cent. salicylanilide, 0·50 per cent. ammonium copper carbonate, and 0·40 per cent. colloidal sulphur A sprays, of which the two last-named were shown in preliminary trials to be the most suitable under commercial glasshouse conditions. Ammonium copper carbonate also gave indications of being a useful spray on already diseased tomato crops. Among the 27 fumigants tested, ethylene dibromide, quinone, and thymol controlled the leaf mould in laboratory experiments, and quinone was effective in trials in a small glasshouse, but further work is required to determine whether this substance is suitable to fumigation in large glasshouses. Fumigations with Campbell's sulphur vaporizer [ibid., i, p. 437] gave protection against infection only to the upper side of the leaves, and failed to kill the spores on the under side of infected leaves. While the leaf surface on which infection occurs under natural conditions has not yet been established, inoculation experiments indicate that either side of the tomato leaf may be infected. A further series of experiments showed large empty glasshouses may be practically freed from infection by *C. fulvum* by fumigations with formaldehyde or sulphur dioxide.

HUBERT (E. E.). **An outline of forest pathology.**—543 pp., 9 pl., 150 figs., 16 diags., 2 maps, New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1931.

In this very useful work the author aims at a presentation of the fundamental principles and practices underlying the pathology of wood products as well as that of growing trees, emphasis being laid throughout on North American conditions. The subject is considered under the following aspects: a brief historical survey of the science of forest pathology; classification of tree diseases; the influencing factors (including heredity and predisposition); the relative importance of tree diseases; symptoms and diagnosis; non-organic or physiogenic, organic, semi-parasitic, and sapro-

phytic agencies; the properties of decayed wood; the relative resistance of wood to decay; and control methods. Extensive observations are made on the various classes of timber rots, both in the living tree [*R.A.M.*, vi, p. 450] and in felled and structural timber. A large number of the illustrations are original.

BUISMAN (CHRISTINE). **Three species of Botryodiplodia (Sacc.) on Elm trees in the United States.**—*Journ. Arnold Arboretum*, xii, 4, pp. 289–296, 2 pl., 1 fig., 1931.

Three different species of *Sphaeropsis* or *Botryodiplodia* (the latter name being preferred by the writer) have been found on elm twigs in New England, viz., *B. malorum* [*Physalospora cydoniae*] and *B. ulmicola* on *Ulmus americana* and *B. hypodermia* on *U. foliacea* [var.] *suberosa*.

Pycnidia of *P. cydoniae* were found on two-year-old and older twigs, sometimes in association with *Phomopsis* and *Cytospora* spp. The fungus may form a canker extending over the whole twig or only along one side. The infected twig assumes a brown colour and brown streaks may extend for some distance into the healthy wood. The twigs above a cankered area often lose their leaves and die. Apple fruits inoculated with monospore cultures of the fungus developed typical mummies. The pycnospores from elm and apple twigs, respectively (50 each), were 21 to 24 by 10 to 12 and 20 to 23 by 10·5 to 13 μ, the corresponding figures from cultures being 23 to 26 by 10 to 12 and 22 to 25 by 9 to 11 μ. The relative numbers of continuous and bicellular spores varied in different isolations. Cross-inoculation experiments on elm and apple did not result in canker formation, so that the fungus is evidently not a virulent parasite and may possibly only attack trees previously weakened by some other cause.

B. ulmicola (Ell. & Ev.) nov. comb. [ibid., x, p. 633, as *Sphaeropsis*] was also isolated from twig cankers on *U. americana*, and spores were produced in subsequent cultures on sterilized elm twigs. Both hyaline, unicellular, and dark brown, bicellular spores occurred in the same culture, irrespective of the original colour of the spores used. The average dimensions of the hyaline spores were 27 to 30 by 14 to 15 μ and those of the brown ones 25 to 30 by 12 to 15 μ. The fungus was inoculated into young elms, in which, however, it failed to progress beyond the site of inoculation.

Petrak and Sydow (Die Gattung der Pyrenomyceten, Sphaeropsideen and Melanconieen, 1927) include *S. ulmicola* under *B. hypodermia* (Sacc.) Petr. et Syd., but the fungus isolated from the Wisconsin twigs agrees closely with Ellis and Everhart's description of *S. ulmicola*, whereas Petrak's and Sydow's diagnosis of *B. hypodermia* corresponds with the third species found by the writer on elm twigs, as described in the next paragraph.

B. hypodermia, found only on dead twigs of *U. foliacea* [var.] *suberosa*, produced almost exclusively hyaline spores, but a few brown, bicellular ones were detected both in nature and in culture. The dimensions of the hyaline spores on three twigs were 29 to 34 by 15 to 18, 26·5 to 30 by 16·5 to 20, and 26 to 29 by 15·5 to 18 μ, respectively; while in three monospore cultures they measured

29 to 34 by 16 to 19, 34 to 37 by 16 to 17, and 32 to 37 by 16 to 19 μ, respectively. The brown spores from a twig measured 26 to 31 by 15 to 18 μ and from three monospore cultures 35 to 39 by 15·5 to 17·5, 32 to 37 by 15 to 17, and 27 to 32 by 15 to 18 μ, respectively. Some degree of success was obtained in inoculation experiments with *B. hypodermia* both on elm saplings and apple fruit, causing typical cankers on the former and a deeply sunken rot on the latter.

MAY (C.). **A new Elm disease.**—*Science*, N.S., lxxiv, 1922, p. 437, 1931.

From slightly over 10 per cent. of some 300 specimens of diseased elms from Iowa, Missouri, New York, Washington, D.C., and various parts of Ohio, a species of *Cephalosporium* was isolated in 1930 characterized on potato dextrose agar by a light brown mycelium and hyaline, elliptical or irregular conidia measuring 4·5 by 1·9 μ (average of 50) and occasionally occurring in loose groups on a small head borne on the end of a short conidiophore. Some of the trees died during the summer of 1930, while others lost part of their tops.

In the spring of 1931, 14 young elms were inoculated with the fungus, and about a month later seven of the trees began to show a drooping and wilting of the leaves, generally preceded or accompanied by a distinct yellowing and followed by defoliation, though some of the leaves turned brown and remained on the twigs for over a month. The diseased twigs and branches died, as well as the main trunk above the point of inoculation, and some trees also showed a blackening of the bark. Most of the branches below the point of inoculation remained healthy.

A brown discoloration of the cambium and current growth of sapwood was apparent in the diseased branches. The staining was more uniform and rather more diffuse than that occurring in cases of infection by *Graphium ulmi* or *Verticillium* [*albo-atrum*: ibid., x, p. 633]. The *Cephalosporium* was reisolated from the inoculated diseased trees but not from those that developed no symptoms after inoculation.

DEMAREE (J. B.). **Diseases of Pecans in the southern States.**—*U.S. Dept. of Agric. Farmers' Bull.* 1672, 27 pp., 21 figs., 1931.

This bulletin (superseding No. 1129 of the same series) presents in a popular form the available information on the following pecan diseases and their control in the southern United States: scab (*Cladosporium effusum*), leaf blotch (*Mycosphaerella dendroides*), brown leaf spot (*Cercospora fusca*), nursery blight (*Phyllosticta caryae*) [*R.A.M.*, x, p. 646], crown gall (*Bacterium tumefaciens*), powdery mildew (*Microsphaera alni*) [ibid., iii, p. 381], western sooty spot (*Gloeosporium caryae* var. *curvisporum*), leaf spot caused by *Gnomonia* sp., downy spot (*Cercosporella caryigena*) [ibid., x, p. 646], wood rots, rosette [ibid., ii, p. 135], sand burn, little leaf, winter injury, and oedema.

M. dendroides produces brown or greenish-brown, later almost black spots, often uniting to form large irregular blotches, on the

under sides of the leaves. The fungus is first observed in late June or early July on the older leaflets and may gradually extend until all the mature leaves are spotted or killed, defoliation spreading upwards until the beginning of November. Blotch is often the most prevalent foliage disease of budded or grafted nursery trees and is usually responsible for premature leaf shedding. *C. fusca* produces reddish-brown, later greyish, zonate, circular to irregular spots which frequently result in total defoliation, the Stuart variety being particularly susceptible while Moneymaker is also liable to severe injury. Both leaf blotch and brown leaf spot may be controlled by two applications or 3–4–50 Bordeaux mixture or three of copper lime dust (20–80).

DENNIS (R. W. G.). **The black canker of Willows.**—*Trans. Brit. Mycol. Soc.*, xvi, 1, pp. 76–84, 1931.

This is a summarized account of the investigation in 1929–30 at the University of Bristol of the black canker disease of basket willows (*Salix* spp.) in the west of England. Parallel inoculation experiments [details of which are given] with *Physalospora miyabeana* [*R.A.M.*, xi, p. 139] originating from local isolations, and with cultures of *Fusicladium saliciperdum* [*Venturia chlorospora*: ibid., xi, p. 161] obtained from Nattrass, and from Clinton and McCormick (since no fructifications of this fungus could be found locally) on young stems of *S. americana*, young leaves and just expanding buds of *S. vitellina*, *S. americana*, and *S. purpurea*, showed that under the conditions of the tests, *F. saliciperdum* consistently gave negative results, while *P. miyabeana* gave positive infections in every case. These results are considered to indicate that in western England *P. miyabeana* alone is responsible for the disease.

Berättelse över forstförvaltningens verksamhet år 1928. [Report on the work of forest administration in the year 1928.]—*Finlands Officiella Statistik*, Helsingfors, 100 pp., 1931.

In a brief note on the insect and fungus pests of forest trees observed in Finland during 1928, cone rust (*Chrysomyxa pyrolae*) of Norway spruce [*Picea excelsa*: *R.A.M.*, ix, p. 420] is stated to have spread widely and caused much damage in the western districts. In the north and east of the country minor injuries were inflicted on the same host by the snow cover fungus [*Phacidium infestans*: ibid., xi, p. 136].

NELSON (R. M.). **Decay in Loblolly Pine on the Atlantic coastal plain.** [*ex* Garver (R. D.), Cuno (J. B.), Korstian (C. F.), and MacKinney (A. L.). Selective logging in the Loblolly Pine-hardwood forests of Middle Atlantic coastal plain with special reference to Virginia.]—*Virginia For. Serv. Publ.* 43, pp. 58–59, 1931.

A study was made of decay in 867 trees [of *Pinus taeda*] in connexion with a forest utilization study in eastern Virginia. The trees were mostly between 50 and 80 years of age. Ninety-five (11 per cent.) of the trees were found to have red heart due to

Trametes pini. The percentage of trees infected increased from 5 in the 40 to 90 year age class, to 19, 60, and 72, respectively, in the 90 to 140, 140 to 190, and 190 to 230 year age classes. Sporophore production was almost entirely limited to trees over 18 inches in diameter, and no other reliable external symptom of decay was discovered. In the 15 trees that bore sporophores, the length of bole infected averaged 50 ft. Figures are given for the deduction in log scale for decay and for the actual loss in lumber sawed from infected logs, the former being found to be considerably greater than the latter. Infections by *T. pini* originated almost entirely in the upper bole, and the decay caused by other fungi was negligible.

GUINIER (P.). **Le rouge des aiguilles du Douglas.** [Needle fall of Douglas Fir.]—*Bull. Soc. Centr. Forest. Belgique*, xxxviii, 8, pp. 352–357, 3 pl., 1931.

After briefly describing the symptoms and distribution of needle fall of Douglas fir (*Rhabdocline pseudotsugae*) [*R.A.M.*, xi, p. 142] the author states that the disease apparently remains unrecorded in Belgium, Switzerland, Czecho-Slovakia, and France.

Strict measures to prohibit the entry of diseased material have been taken by France [ibid., x, p. 480] and Germany [ibid., ix, p. 816], but even if the disease should appear in France, the author considers that it will probably remain unimportant, as the highly resistant green leaf Douglas [*Pseudotsuga taxifolia*] is much more widely grown there than the susceptible blue Douglas [*P. glauca*], the plantations are not dense, and the climate is too dry to favour the disease.

BARNETT (EUPHEMIA C.). **Some fungi on Bracken.**—*Trans. Brit. Mycol. Soc.*, xvi, 1, pp. 85–86, 1931.

In this brief note the author states that of two pycnidial forms (A and B) commonly found on bracken [*Pteridium aquilinum*] affected with the dying back disease in Scotland [*R.A.M.*, viii, p. 412], the first was shown in cultural tests to be a stage in the life-history of *Rhopographus filicinus*, single spore cultures of which produced similar pycnidia either completely embedded in a black stroma or else superficial and provided with a definite black wall. The spores contained in the natural pycnidia and in those formed in culture were also similar. The second form, which is of constant occurrence on all the aerial and underground parts of diseased plants, developed from perithecia of the *Mycosphaerella* type on bracken which apparently bore no other organism and was kept in the laboratory. The perithecia were embedded in the host tissues and were provided with a hard, black wall and a distinct ostiole; they averaged 140 μ in diameter. The ascospores are narrowly oval, two-celled, tapering at both ends, sometimes slightly curved; no completely mature spores were present, but those that could be measured were about 35 by 4 μ. The pycnidia are roundish, ostiolate, brown to black, and contain hyaline, oval, curved pycnospores, 20 to 30 by 4 to 6 μ, continuous when young and 1- to 3-septate when older.

Report of the Provisional Forestry Board for the year ended 30th June, 1930.—Queensland Forest Service, Brisbane, 90 pp., 17 pl., 1930.

In a note on p. 39 of this report it is stated that the losses due to blue stain [*Ceratostomella* spp.: *R.A.M.*, x, p. 143 *et passim*] in pine stocks at country sawmills in Queensland have recently become so serious that special investigations have been carried out with a view to remedying this condition. At Brisbane it was found that stocks of pine seasoned in the open air are little affected by blue stain. At Maryborough many of the logs arriving at the mills were found to have already become contaminated in transit, while in other cases infection developed on the exposed timber if sawing was delayed. Timber sawn from clean logs showed no tendency to turn blue in the exposed seasoning stacks, many of which were low and built on swampy ground. At other mills blue stain was in evidence wherever rain had penetrated the seasoning stacks, while the dry portions remained clean. The fact that blueing occurs in open air stacks at some mills and not at others is attributed to the position of the former in the 'cloud belt' (over 1,000 ft. above sea level), where a greater number of wet or dull days is experienced, although the actual rainfall in the lower towns is higher. In the latter situations, however, the more frequent sunshine keeps the stacks reasonably dry. The moisture content of boards from the mountain range was found to be considerably higher than that of corresponding material from the plain.

It was recommended that the delay between felling and sawing should be reduced to a minimum. Where delay is unavoidable the piles should be covered. Sawn timber should be kept in covered stacks in the open air.

Daniels (A. S.). **A dish for toxicity tests.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), iii, 4, p. 358, 1931.

The writer has found Stender dishes superior to both Petri dishes and Erlenmeyer flasks in the testing of wood preservatives. After plating and inoculating the cultures in Petri dishes in the ordinary way, a sterile 100 mm. Stender dish is inverted on the table. The bottom is raised a few inches and the prepared Petri dish slid on to the Stender dish cover. The cover of the Petri dish is removed, the ground groove in the Stender dish cover filled with melted, hard vaseline, and the Stender dish gently lowered and fitted back into the vaseline-filled groove of the cover. Cultures thus prepared are convenient to handle and they effectively prevent the volatilization of any appreciable portion of the substance under test.

Falck (R.) & Kamesam (S.). **Ein neues, allgemein verwendbares Holzschutzmittel.** [A new timber preservative adapted for general use.]—*Chem. Zeit.*, lv, 87, pp. 837–838, 1931.

The writers' experiments, conducted at the Mycological Institute of the College of Forestry, Hann.-Münden, in the development of a timber preservative combining a high degree of toxicity to wood-destroying fungi and insects with non-corrosive properties and

resistance to leaching out, demonstrated the efficacy of a mixture of equal parts of arsenic pentoxide and potassium or sodium bichromate. Comparative tests with this compound over 30 standard wood preservatives are stated to have shown the superiority of the first-named in the above-mentioned aspects. The arsenic pentoxide mixture possesses the further advantages of cheapness, simplicity of preparation, and facility of transport and manipulation.

ANDERSON (B. A.). **The toxicity of water-soluble extractives of Western Yellow Pine to Lenzites sepiaria.**—*Phytopath.*, xxi, 10, pp. 927–940, 1 fig., 1 graph, 1931.

A tabulated account is given of the writer's investigations on the toxicity to *Lenzites sepiaria* of water-soluble substances extracted from kiln-dried and air-seasoned heartwood and sapwood of western yellow pine (*Pinus ponderosa*) [*R.A.M.*, ii, p. 51]. The extracts were evaporated down to 1 c.c. per gm. of wood-flour. The fungus was grown on varying concentrations of wood-flour extract and malt agar, and on 1·5 per cent. malt agar alone for control purposes. The air-seasoned heartwood extract soaked for three hours in boiling water was most toxic to the organism, the growth of which was totally inhibited by the 25, 50, and 75 per cent. concentrations, and showed 41 per cent. retardation on a 10 per cent. strength. The lowest degree of toxicity was exercised by the cold-water treated, kiln-dried sapwood, indicating that a loss of certain volatile materials destructive to the fungus results from the temperatures (approximating 180° F.) at which kiln-drying is carried out.

FRON (G.). **Au sujet du Merulius lacrymans ou champignon des maisons.** [On the subject of *Merulius lacrymans* or house fungus.]—*Journ. d'Agric. Prat.*, N.S., xlv, 41, pp. 300–301, 1931.

Replying to a correspondent, the writer gives a brief account in popular terms of the symptoms, mode of infection, and control of the dry rot fungus (*Merulius lacrymans*).

The development of the fungus is favoured by the use of insufficiently dried wood (with a moisture content exceeding 15 per cent.), defective ventilation, and the employment of alkaline substances, such as clinkers, cinders, or sea sand to fill the spaces between joists and beams.

The efficacy of carbolineum and similar coal-tar products in the control of *M. lacrymans* is regarded as indisputable, but the use of such preparations is not always practicable on account of their unpleasant odour and liability to stain the wood. Good results have been obtained with etymolos, raco, and mykanthine (mixtures of phenol and sodium fluoride), while the writer specially recommends mycothanaton, which may be made at home according to the following formula: 750 gm. calcium chloride, 1,500 gm. sodium sulphate, 2 l. hydrochloric acid, 66 gm. bichloride of mercury, and 57 l. water.

HUMPHREY (C. J.). **Decay of wood in automobiles in the tropics.** —*Philipp. Journ. of Sci.*, xlvi, 2, pp. 189–197, 2 pl., 1931.

Very serious depreciation is stated to occur in motor cars in the Philippine Islands as a result of decay of the wood by *Lenzites striata* [*R.A.M.*, v, p. 397], *Polyporus* [*Polystictus*] *sanguineus*, and *Trametes versatilis* [ibid., x, p. 635]. Some general observations are made on the conditions favouring attack by these organisms, and on the control of the latter by the application of standard wood preservatives and the use of durable native timbers, e.g., *Dipterocarpus grandiflorus*, for construction and replacement instead of the relatively perishable American woods now commonly employed for these purposes.

LINFORD (M. B.). **Streak, a virus disease of Peas transmitted by Thrips tabaci.**—Abs. in *Phytopath.*, xxi, 10, p. 999, 1931.

Canning peas (*Pisum sativum*) were observed in 1928 to show a streaking and spotted brown necrosis of pods, stems, and leaves, the disease being apparently widespread in the United States. The pods may show necrotic circular pitting or they may collapse altogether; on the leaves the injury may begin with spotting or brown vein streaking extending down the stems and associated with phloem necrosis. No micro-organisms were found in connexion with this disease. During investigations of pineapple yellow spot in Hawaii [*R.A.M.*, xi, p. 191], infective thrips (*Thrips tabaci*) were transferred to peas from diseased *Emilia sagittata* [*E. flammea*], with the result that the typical streak symptoms developed in 21 out of 45 plants. Thrips reared on infected peas reproduced the streak symptoms on the host and those of yellow spot on pineapple The incubation period in peas lasts about 12 to 20 days. Streak caused by the yellow spot virus was found in market-gardens near Honolulu.

HARTER (L. L.) & ZAUMEYER (W. J.). **Pythium butleri—the cause of a Bean wilt.**—*Phytopath.*, xxi, 10, pp. 991–994, 1931.

This is an expanded account of the writers' investigations on the occurrence of bean (*Phaseolus vulgaris*) wilt caused by *Pythium butleri* in Colorado and Virginia [*R.A.M.*, x, p. 423]. *Pythium* has long been known as the cause of bean root rots and damping-off of seedlings, but this is believed to be the first record of its pathogenicity to almost mature plants in the field. During 1930 the disease was observed in five large plantings in Colorado, causing a reduction in stand of 10 to 12 per cent., and also in Virginia. In both localities the season was excessively dry with high temperatures, but the relative humidity during the night was close to saturation. The disease occurred with equal severity both on irrigated and non-irrigated soil.

The symptoms developing in seedlings and young plants inoculated through wounds at the cotyledonary node with the mycelium of *P. butleri* were typical of those observed in the field. Wilting did not occur at the ordinary greenhouse temperatures of about 21° during the day and 16° at night, but it developed in three to four days in plants placed in an infection chamber at 30° with an almost saturated atmosphere. In a further test, two sets of nine plants

each were inoculated at soil level, one set being surrounded by sphagnum to keep the stems moist and the other left uncovered. No infection developed at ordinary greenhouse temperatures, but the plants wilted in three or four days at 36°, indicating that high temperatures are of greater importance than high humidity in furthering infection.

MACKIE (W. W.) & ESAU (KATHERINE). **A preliminary report on resistance to curly top of Sugar Beets in Bean hybrids and varieties.**—Abs. in *Phytopath.*, xxi, 10, p. 997, 1931.

Beans have been observed to be liable to infection by curly top of sugar beet since 1919 [*R.A.M.*, ix, p. 229]. In a test in which short rows of bean hybrids and varieties were infested, at the fourth leaf stage, with infective nymphs of *Eutettix tenella*, 51·6 of the white varieties of *Phaseolus vulgaris* were destroyed, the corresponding figures for the pink and mottled ones being 29 and 30, respectively. The one variety of *P. multiflorus* tested contracted 100 per cent. slight injury, while *P. lunatus* [var.] *sieva* showed 17 per cent. severe damage. In the cross between the mosaic-resistant Robust, a white pea bean, and the curly top-resistant California Pink, a number of fixed resistant hybrids were secured in both pink and white beans, indicating only a partial correlation between pink coloration and resistance.

NATTRASS (R. M.). **The occurrence of the 'white rot' of the Onion (Sclerotium cepivorum, Berk.) in Egypt.**—*Min. of Agric. Egypt. Tech. & Sci. Service* (*Plant Protect. Sect.*) *Bull.* 107, 9 pp., 9 pl., 1931.

White rot of onions (*Sclerotium cepivorum*) [*R.A.M.*, x, p. 499] was detected in Upper Egypt during the season 1930–1. So far it appears to be confined to a very small area, and the careful inspection at Alexandria of large quantities of onions destined for export failed to reveal the presence of the fungus. However, in view of the extent and value of the export trade in onions, considerable potential importance attaches to the discovery of this disease, the eradication of which presents great difficulties.

Comparative studies were made on various media of the Egyptian strain of *S. cepivorum* and one procured from the Centraalbureau voor Schimmelcultures, Baarn. The optimum temperature for the growth of both strains was 22° to 24° C. (minimum 16°, maximum 35°). At all temperatures and media tested the Dutch strain made more vigorous growth than the Egyptian one, producing a denser, more floccose type of mycelium and forming micro-sclerotia up to 16 days later.

White rot becomes apparent in Upper Egypt during February and March, when the average soil temperatures for fallow land 5 cm. below the surface are 18·7° and 22·5° C., respectively. After March the soil temperature rises above 30° and may reach 60° on the surface. The control of the disease should be based on preventive cultural measures, special attention being paid to the use of seedling plants raised on healthy soil. Once infection has become established, onions should not be grown again on the diseased area for at least eight years. The following legislative

measures are also contemplated . inspection during grading, prohibition of export from scheduled areas, and periodical Government inspections of the grading yards.

HAMMARLUND (C.). **Kleinere mycologische Notizen II. Eine Riesenform von Peronospora brassicae Gäumann [= P. parasitica (Fries) Tulasne] auf Raphanus sativus f. radicula.** [Shorter mycological notices II. A giant form of *Peronospora brassicae* Gäumann [= *P. parasitica* (Fries) Tulasne] on *Raphanus sativus* f. *radicula*.]—*Bot. Notiser*, *1931*, 5, pp. 392–393, 1931.

In the south of Sweden *Peronospora brassicae* (*P. parasitica*) [*R.A.M.*, viii, p. 290]; is widely distributed on the leaves, petioles, stems, and flowers of wild and cultivated radishes (*Raphanus raphanistrum*, *R. sativus* f. *radicula*, and *R. sativus* f. *nigra*), as well as on several other plants. It is occasionally found also on the portions of radish tubers protruding above soil level, in which case the conidiophores assume abnormally large dimensions (average height of 100 individuals, 773 ± 6·1 μ, maximum 1,070 μ, minimum 540 μ, average thickness 19·7 ± 0·4 μ, maximum 21·6 μ, minimum 16·2 μ). The conidia were also unusually large (average of 100, 31·2 ± 0·5 by 22·6 ± 0·1 μ, maximum 35·1 by 24·3 μ, minimum 27 by 21·6 μ). On the leaves of the same plant the conidiophores measured 265 ± 4·2 μ in height and 11 ± 0·3 μ in breadth, and the conidia 25 by 21 μ. The oospores on the tubers were approximately normal in appearance and size (45 by 24 μ).

The phenomenon is tentatively attributed to the availability of large food supplies in the tubers.

KENDRICK (J. B.). **Seed transmission of Cowpea Fusarium wilt.**—*Phytopath.*, xxi, 10, pp. 979–983, 1 fig., 1931.

Preliminary trials [brief notes on which are given], at Davis, California, showed conclusively that the causal organism of cowpea wilt, *Fusarium tracheiphilum* [*R.A.M.*, ix, p. 360], is carried on the seed, but no evidence was obtained that it penetrates the seed coats. In tests in which plants grown from threshed seed were compared with those from hand-picked seed in which contamination during picking was avoided, a considerable percentage of the former developed wilt symptoms, which were practically absent in the latter. Cultures from carefully removed seed in young pods failed to yield the fungus even when the the latter was obtained from the interior of the pod stalk.

RAVAZ (L.). **Chronique.—Observations à faire sur le mildiou.** [Current events.—Observations on mildew that should be made.]—*Prog. Agric. et Vitic.*, xcvi, 36, pp. 225–228, 1931.

The author states that at the time when this paper appeared (early September, 1931) a severe epidemic of vine mildew [*Plasmopara viticola*] was still in progress in the rainy areas of central and western France, while in the south little, if any, damage was done by the disease. Since there was some evidence that weaker stocks, even within the same variety, are less susceptible to *P. viticola* than more vigorous plants, he asks for the communication

to him of observations by practical growers, which may support or disprove this point.

RAVAZ (L.). **Chronique.—Sécheresse. Fils de fer. Pourriture grise. Eudémis. Mildiou.** [Current events.—Drought. Wires. Grey rot. *Eudemis.* Mildew.]—*Prog. Agric. et Vitic.*, xcvi, 35, pp. 201–204, 1931.

In discussing the influence on attacks of mildew [*Plasmopara viticola*] of the method of training vines on wires or of allowing them to grow unsupported, the author points out that the former method necessitates leaving on the stocks long branches which are stretched along, and fixed to the lower wire strands, permitting the grape bunches to develop exposed to air and light. Under such conditions the grapes do not swell to excess and have a tough skin which gives them good protection against invasion by the fungus, the cause of the much dreaded grey rot of less resistant bunches. As regards the foliage, the method of growing the vines does not appear to have any marked bearing on the susceptibility of the leaves to infection with mildew in the early spring, but later in the season, the leaves of wired vines are more exposed to infection with air-borne spores than those of untrained stocks; after the harvest, however, observations show that trained vines retain their foliage free from severe mildew attacks, while that of unsupported stocks is rapidly destroyed by the fungus; this effect is attributed to the absence or short duration of morning dews on the leaves of the former, owing to their higher position above soil level.

MOREAU (L.) & VINET (E.). **Sur les traitements curatifs du mildiou.** [On the curative treatments of mildew.]—*Rev. de Vitic.*, lxxv, 1937, pp. 105–108, 1931.

This is a somewhat contracted version of the authors' paper on the inadequate fungicidal action of the yellow and orange 'héliones' [organic colouring substances: *R.A.M.*, ix, p. 327] on vine mildew [*Plasmopara viticola*], which has already been noticed [ibid., x, p. 432].

WOODFIN (J. C.). **Control of Oidium in vineries.**—*New Zealand Journ. of Agric.*, xliii, 4, p. 287, 1931.

In giving a brief account of the measures applicable in vine-houses for the control of vine *Oidium* [*Uncinula necator*] the author states that good results may be obtained by spraying the vines with a solution of permanganate of potash made with sufficient water (to which $\frac{1}{2}$ oz. of slaked lime per gallon has been added) to reduce the colour of the mixture to a light pink [cf. *R.A.M.*, viii, p. 700]. It is pointed out, however, that this spray does not act as a protective and should be supplemented by sulphur dusting.

LUTHRA (R. S. L. J. C.). **India: some fungal diseases of farm crops recently discovered in the Punjab.**—*Internat. Bull. of Plant Protect.*, v, 10, p. 188, 1931.

Mention is made of some plant diseases recently observed in the

Punjab, India, among which is the black rot of grapes due to *Guignardia bidwellii* [*R.A.M.*, x, p. 640].

ALCOCK (Mrs. N. L.) & FOISTER (C. E.). **List of fungous diseases received by the Pathological Department of the Department of Agriculture for Scotland.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 4, pp. 338–350, 1931.

This is a list [arranged according to the hosts] of the diseases of crop and ornamental plants and trees which have been received since 1924 for examination by the Plant Pathology Laboratory in Edinburgh.

KERN (H.). **Hungary: new or rare cryptogamic diseases.**—*Internat. Bull. of Plant Protect.*, v, 11, pp. 200–201, 1931.

Among other new or rare bacterial and fungous diseases observed in Hungary during 1929 and 1930 the following may be mentioned: *Bacillus* [*Bacterium*] *phaseoli* on beans (*Phaseolus vulgaris*) [*R.A.M.*, viii, p. 753; ix, p. 625]; *B. sorghi* on *Sorghum halepense* var. *sudanense* [*Andropogon sorghum* var. *sudanensis*: ibid., viii, p. 753]; *Pseudomonas pisi* on peas [ibid., ix, p. 700], this being the first record for Hungary; *Cladosporium macrocarpum* on spinach; *P. spongiosa* [*Bacillus spongiosus*] on apricot [ibid., xi, p. 58]; *Sclerotinia fuckeliana* and *Botrytis cinerea* on potato [ibid., viii, p. 607; ix, p. 626]; and *S. nicotianae* on tobacco [ibid., vii, p. 546]; the three last-named diseases being new for the country.

NOBLE (R. J.). **New South Wales: plant diseases.**—*Internat. Bull. of Plant Protect.*, v, 11, pp. 202–205, 1931.

This report of the plant diseases observed in New South Wales during the year ending 30th June, 1931, contains the following among other items of interest. Root and stalk rots of maize (*Fusarium moniliforme* [*Gibberella moniliformis*] and *G. saubinetii*) were fairly prevalent, the former organism causing unusually severe damage to the cobs, being favoured by the comparatively heavy autumn and winter rains. Cob rot (*Basisporium gallarum*) [*Nigrospora sphaerica*: *R.A.M.*, x, p. 644] was recorded for the first time in the State. Rice was attacked, also for the first time in New South Wales, by *Sclerospora macrospora* [ibid., ix, p. 513].

An obscure rosette or spindle shoot of lucerne was widespread. Soy-beans were infected by *Bacterium glycineum* [ibid., vii, p. 510] and *Bact. phaseoli* [var.] *sojense* [ibid., ix, p. 359].

The most serious and widespread disease of beans [*Phaseolus vulgaris*] was the blight due to *Bact. phaseoli* [ibid., x, p. 422], which affected the Canadian Wonder variety. Mosaic [ibid., ix, p. 502 *et passim*] was also prevalent in this crop. In metropolitan areas the most severe damage to peas was caused by *Ascochyta pisi* and *A. pinodella* [ibid., xi, p. 150], while other diseases included those due to *Bact.* [*Pseudomonas*] *pisi* and *Septoria pisi* [ibid., x, p. 161].

Citrus fruits in low-lying areas showed up to 100 per cent. infection by *Phytophthora hibernalis* [ibid., x, p. 161].

Haigh (J. C.). **Report on the work of the Mycological Division.** —*Ceylon Administration Report of the Director of Agric. for 1930*, pp. D65–D70, 1931.

A list of fungal diseases recorded for the first time in Ceylon during 1930 [cf. *R.A.M.*, x, p. 79] includes *Cladosporium herbarum* var. *citricola* on orange, *Uromyces decoratus* on *Crotalaria juncea*, *Phytophthora* sp. on carnation, *Cercospora dioscoreae* on yam (*Dioscorea alata*), *Cytospora* sp. and *Oidium* sp. on mango, *Rosellinia arcuata* on apple, *Sclerotium rolfsii* on eggplant, *Phakopsora vitis* on vine, and *Gloeosporium papayae* on papaw. In the last-named disease, papaw fruits 8 to 10 days old shrivelled and fell after a wet period; no external mycelium was present, but the fruits were discoloured at the stem end. Isolations from diseased material invariably gave *G. papayae*, which grew vigorously on sterile unwounded papaw fruits, rotting them completely in fifteen days. Inoculation tests demonstrated that the fungus was able to attack immature and previously uninjured fruits on the tree, the original symptoms being reproduced and the organism recovered from the lesions.

Plantains were affected by a condition closely resembling that caused in the West Indies by *Bacillus musae* [*Bacterium solanacearum*: ibid., x, p. 472], and also by a rot (apparently bacterial) which affects the tip of the unrolled leaf and the youngest leaves and fruit spike still enclosed within the pseudo-stem.

A study has been undertaken of the virus diseases of Solanaceous crops. The commonest disease of tobacco was bacterial wilt (*Bacillus* [*Bact.*] *solanacearum*), but this was not known to affect large areas.

Notes are given on numerous other diseases investigated in Ceylon during the period under review.

Sundararaman (S.). **Administration Report of the Mycologist for the year 1930–1.**—20 pp., 1932.

Blast of rice [*R.A.M.*, x, p. 337] occurred with unprecedented severity at Coimbatore, Madras, during the period under review.

Periodical counts of the incidence of sugar-cane mosaic [ibid., x, p. 360] in the experimental plots confirmed the previous year's observation that under Coimbatore conditions secondary infection makes rapid progress between the second and fourth months of the growing period, followed by a sharp decline till after the seventh month, when infection ceases altogether.

The percentage of seedling blight (*Colletotrichum* sp.) infection on Uppam cotton at the Central Farm ranged from 30 to 82, with an average of 60·5.

The incidence of 'clump' of groundnuts [ibid., vii, p. 696] at the Agricultural Research Station, Palakuppam, ranged from 2·4 to 17 per cent.; the yield of diseased plants was about 30 per cent. of the normal.

Out of a total of 64,567 gingelly [*Sesamum indicum*] plants in a field on the Central Farm, 23,642 (36·6 per cent.) showed infection by wilt (*Macrophomina phaseoli*) [ibid., x, pp. 360, 437], the yield from the diseased plants being only about 43 per cent. of the normal. Soil infection experiments with the fungus gave positive

results on black gram [*Phaseolus mungo*], *S. indicum*, mustard, French bean [*P. vulgaris*], and sunflower, the two first-named being the most susceptible. The pycnidia of the fungus developed on sterilized portions of *P. mungo* and *S. indicum* stems inoculated with the strains isolated from these hosts respectively, and they were further detected on diseased Cambodia cotton stems, this being the first record of the development of the *Macrophomina* stage on the host in question.

Plantain wilt (*Fusarium cubense*) was observed chiefly on the Rastali variety but occasionally also on Poovan in the Trichinopoly district [cf. ibid., ix, p. 730].

Mosaic of *Dolichos lablab* was much in evidence. The leaves were severely mottled and affected plants shed their flowers more freely than healthy ones [cf. ibid., xi, p. 150].

DURRELL (L. W.). **Report of the Botanist.**—*Forty-fourth Ann. Rept. Colorado Agric. Exper. Stat. for the fiscal year 1930–31*, pp. 25–31, 1931.

The most important disease of greenhouse plants in the Denver district of Colorado was found to be root rot of carnations, the causal organism of which (*Rhizoctonia*) is transmissible by cuttings from infected stocks, and is also liable to be spattered from the soil to the leaf sheaths in watering. Copper carbonate dust has proved superior to sulphur in the control of sweet pea mildew (*Erysiphe polygoni*) under glass. The Sidawitz chrysanthemum variety has shown susceptibility to blackleg (*Cylindrosporium*) [*chrysanthemi*]. Bacterial canker of tomato (*Aplanobacter michiganense*: see above, p. 210] and purple blotch of onions (*Macrosporium porri*) [*R.A.M.*, x, p. 499] were the chief diseases in the Arkansas Valley truck crops.

SACKETT (W. G.). **Report of Bacteriologist.**—*Forty-fourth Ann. Rept. Colorado Agric. Exper. Stat. for the fiscal year 1930–31*, pp. 19–25, 1931.

The most promising lucerne varieties among those undergoing trials for reaction to winter injury and bacterial wilt [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 602] are the Canadian Variegated, Cossack, and Grimm. Counts made in the spring of 1931 showed considerable mortality in the Common and Argentine varieties, the stands of which are in their critical third year, when the disease is liable to assume economic importance.

No benefit has been derived from the use of two- to three-year-old bean [*Phaseolus vulgaris*] seed as compared with one-year-old in respect of resistance to bacterial blight [*Bacterium phaseoli*: ibid., x, p. 439], which severely attacked all the bean crops throughout the State, including a number of selected Wisconsin varieties reputed to be resistant.

MELCHERS (L. E.). **A check list of plant diseases and fungi occurring in Egypt.**—*Trans. Kansas Acad. Sci.*, xxxiv, pp. 41–106, 1931.

Alphabetical lists are given of the fungi and their hosts observed by the writer during his survey of the plant diseases of Egypt

from 1927–29, with localities, dates, and names of collectors (where known). A short list is also given of diseases due to physiological or other agencies distinct from fungi and bacteria.

ABBOTT (E. V.). **Further notes on plant diseases in Peru.**— *Phytopath.*, xxi, 11, pp. 1061–1071, 1931.

Several plant diseases hitherto unreported in Peru have come to the writer's attention since the publication of his former paper [*R.A.M.*, ix, p. 63], while fresh information on the importance and distribution of others has been accumulated. The following are some of the more interesting records.

Sugar-cane mosaic [ibid., viii, p. 688] is very widespread in the Carabayllo Valley, many fields, especially the old ratoons, showing 90 to 100 per cent. infection. At present there is little indication of failure in the Otaheite and Bourbon varieties, even where they have been infected for eight or ten years. Mosaic has not been found outside the Rimac area, and a strict quarantine has been placed on the exportation of seed cane from this region to other parts of the country. The Otaheite variety is occasionally affected by mechanical twisted top [ibid., ix, p. 341] in a mild form.

Cotton wilt (*Fusarium vasinfectum*) is rapidly becoming so serious that several plantations in the Rimac and Carabayllo Valleys have been abandoned. The American Upland varieties, Rowden 40, Rowden 2119, Super Seven, Dixie Triumph, and Express, which have shown resistance to wilt in the United States, all proved to be more susceptible at Lima than the native Tanguis. In the coastal valleys cotton is liable to attack by *Erysiphe malachrae*, sometimes causing partial defoliation but occurring too late in the season to do much damage. *Alternaria* leaf spot killed five acres of cotton seedlings near Lima in 1929.

Stripe rust of wheat (*Puccinia glumarum*) is not uncommon in the sierra. No evidence has been obtained that the species of *Berberis* native to Peru play any part in the perpetuation of stem rust (*P. graminis*), nor was infection found on any of the wild grasses in the valleys near Lima. Rust epidemics near the sea are believed to be initiated by wind-blown spores from the sierra.

Helminthosporium sativum causes heavy damage to Khapli emmer wheat, the only durum variety that can be cultivated on the coast on account of its resistance to stem rust, and also attacks barley. *H. oryzae* has been identified as the cause of 'black point' of rice in several coastal valleys [ibid., x, p. 55].

Phyllachora maydis [ibid., vii, p. 538] is responsible for the premature shrivelling of maize leaves on the coast, while the same host is occasionally infected by *Phoma zeicola* [ibid., vii, p. 711].

Late blight of potatoes (*Phytophthora infestans*) is less prevalent in Peru than was formerly supposed, and does not affect either wild or cultivated species of *Solanum* at elevations above 8,000 to 9,000 ft. The absence of the disease from these regions and its occurrence only where foreign seed-stock has been introduced lend support to Reddick's theory [ibid., vii, p. 739] that the fungus is not indigenous to South America.

Powdery scab of potatoes (*Spongospora subterranea*) is extremely widespread, usually affecting at least 10 and often 50 per cent. of the crop or more; the fungus is, in all probability, endemic in Peru.

The presence of potato wart (*Synchytrium endobioticum*) appears to be restricted to one farm known as Cachi-Cachi, where it was found in 1928 and 1929, but not in 1930. Other diseases of potatoes in Peru include the rusts, *Aecidium cantensis* and *Puccinia pitteriana* [ibid., x, p. 491]; powdery mildew (*Oidium* sp.); stem rot and black scab (*Corticium vagum*) [*C. solani*], which causes severe damage to the choice yellow-fleshed varieties and also attacks a number of other economic plants; tuber rots (*F. martii* [var.] *minus* and *F. solani*); and mosaic.

Diplodia rot of oranges (*D. natalensis*) and a *Fusarium* wilt of papaws are amongst the fruit diseases mentioned.

Tomatoes often suffer severely from mosaic, which in 1929 caused losses amounting to between 50 and 75 per cent. of the crop. Pepper [*Capsicum annuum*] mosaic [ibid., x, p. 809] is also common and often important.

ACOSTA (D. R. y). **Investigaciones fitopatológicas.** [Phytopathological investigations.]—*Min. Indus. Direc. Agron. Publ. Mens.*, iv, 1–2, pp. 1–18, 21 figs., 1931.

A list is given of the diseases of the principal crops and other economic and ornamental plants observed in Uruguay month by month during the period from May, 1929, to December, 1930. Notes are also given on a number of these diseases, of which the following may be mentioned: *Clasterosporium carpophilum* on plums, damsons, and peaches, the last-named host being attacked with particular severity; *Colletotrichum gloeosporioides* on lemon and orange; *Gloeosporium hesperidearum* [*R.A.M.*, x, p. 24] on tangerine and orange, the latter being also infected by *Alternaria citri* and *Phytophthora parasitica* [loc. cit.]; *G. olivarum* on olive [ibid., x, p. 608]; *Coniothyrium diplodiella* on vine [ibid., xi, p. 21]; and yellow rust of wheat (*Puccinia glumarum*), observed for the first time in Uruguay in November, 1929, and again in October, 1930 [ibid., x, 509].

QUIRK (AGNES J.). **Pure smooth and rough colony types at will.**—*Science*, N.S., lxxiv, 1923, p. 461, 1931.

By means of a special technique involving needle transfer to nutrient broth tubes at P_H 6 and P_H 7, respectively, dilution by a second needle transfer to similar tubes, incubation for 18 to 24 hours at room temperature, and again a double dilution transfer to new tubes, it was found possible to produce at will by pouring from the last tubes plates of beef infusion agar at the two P_H values, either smooth (virulent) or rough (non-virulent) colonies of *Bacterium tumefaciens* (hop strain) and *Bacillus phytophthorus* [cf. *R.A.M.*, vi, p. 458]. The smooth colony type was produced only at P_H 7 and the rough one at P_H 6.

THOMAS (J. A.). **Sur les réactions de la tunique d'Ascidia mentula Müll., à l'inoculation de Bacterium tumefaciens.** [On the reactions of the tunic of *Ascidia mentula* Müll. to inoculation with *Bacterium tumefaciens*.]—*Comptes rendus Soc. de Biol.*, cviii, 33, pp. 694–696, 1931.

A virulent strain of *Bacterium tumefaciens*, a thick emulsion of which was inoculated into the tunic of six individuals of *Ascidia mentula*, provoked intense histological reactions, consisting in proliferation and the development of giant cells with a diameter of 25 μ compared with 2 to 3 μ for normal ones.

THOMAS (J. A.). **Sur l'infection du Géphyrien Sipunculus nudus par le Bacterium tumefaciens.** [On the infection of the Gephyrean *Sipunculus nudus* by *Bacterium tumefaciens*.]—*Comptes rendus Soc. de Biol.*, cviii, 34, pp. 772–774, 1931.

A number of individuals of *Sipunculus nudus*, inoculated in the general cavity with 0·5 c.c. of an emulsion of a virulent strain of *Bacterium tumefaciens*, previously used in experiments on *Ascidia mentula* [see preceding abstract]. died in six days. The organism acquired such a degree of virulence by passage through the worms that, after the third passage, it proved fatal in 15 hours. The process of infection is characterized by marked caryotropism on the part of the parasite, which is transformed, in the nucleus and cytoplasm, into grains near the limit of visibility. On the other hand, vigorous reproduction in the form of rod-shaped elements takes place in the protoplasm as a result of the acquisition of septicaemic properties by the organism.

DIPPENAAR (B. J.). **'N bakteriese siekte wat 'n verdorring van die kaffies van Koringare veroorsak.** [A bacterial disease causing desiccation of the glumes of Wheat ears.]—*S. African Journ. of Sci.*, xxviii, pp. 280–283, 1 fig., 1931.

A brief description is given of the symptoms of basal glume rot of wheat (*Bacterium atrofaciens*) [*R.A.M.*, viii, p. 395] which was observed for the first time in South Africa on the Kleintrou variety in 1930.

GOULDEN (C. H.) & NEATBY (K. W.). **Breeding rust-resistant varieties of spring Wheat.**—*Journ. Amer. Soc. Agron.*, xxiii, 11, pp. 859–870, 1 graph, 1931.

Continuing their investigations on the development of spring wheat varieties resistant to rust (*Puccinia graminis*) at Winnipeg, Canada [*R.A.M.*, x, p. 170], the writers conducted tests [the results of which are fully tabulated and discussed] on groups of strains possessing a high degree of mature plant resistance from three crosses, viz., H–44–24 × Marquis, H–44–24 × Reward, and Pentad × Marquis. It was found that in 1930, when there was a severe rust epidemic, the yields of the resistant strains considerably exceeded those of the best standard varieties, Marquis, Garnet, and Reward. The differences in rust reaction within the standard varieties were further shown to be considerably greater than those within the resistant groups. In a study of the seedling reactions to forms 48, 14, 52, and 36 of *P. graminis* of 12 F_5 lines of

Pentad x Marquis, the reactions obtained were practically identical with those of Marquis, thus establishing the independence in inheritance of seedling resistance and the mature plant resistance typical of Pentad.

PEUSER (H.). **Untersuchungen über das Vorkommen biologischer Rassen von Fusarium nivale Ces.** [Investigations on the occurrence of biologic strains of *Fusarium nivale* Ces.]—*Phytopath. Zeitschr.*, iv, 1, pp. 113–128, 3 figs., 1931.

After a preliminary note on the pathogenicity of *Calonectria graminicola* (*Fusarium nivale*) to cereals in Germany, in which Baltzer's views on the saprophytic nature of this fungus [*R.A.M.*, x, p. 94] are disputed, the writer describes his investigations on the occurrence of biologic forms among 50 isolations from various parts of the country.

Considerable difficulty was experienced in obtaining conidia in sufficient numbers for inoculation, most of the nutrient media used seeming rather to encourage mycelial or perithecial formation. Appel's oatmeal agar [cf. ibid., iv, p. 161] proved most useful. The conidia were produced almost exclusively in cultures or parts of cultures exposed to daylight, and a test was therefore made to determine the effect on sporulation of (*a*) monochromatic yellow, (*b*) panchromatic, and (*c*) monochromatic blue rays. The panchromatic and blue rays were found to induce conidial formation to nearly the same extent as daylight, while the yellow ones were almost entirely inhibitory in this respect.

Of the various modes of inoculation tested, infection through the soil gave the most reliable results. The pure line wheat seed-grains (pure lines of rye were not available) were placed 3 cm. below the surface in flower pots containing sifted sand, and covered with a layer of mixed sand and oatmeal, above which a conidial suspension of *F. nivale* in semi-liquid biomalt agar was distributed (20 c.c. per pot). Four to five days after the commencement of the test a delicate, cobweb-like mycelium developed on the surface of the pots; in eight days the seedlings emerged, and after ten to twelve days the first symptom of infection—a brown discoloration of the cotyledonary sheath just above soil level—became apparent. All the twelve standard wheat varieties (including the well-known Strube's Dickkopf, Pflug's Baltikum, Criewener 104, and Krafft's Siegerländer) tested for their reaction to 37 isolations of *F. nivale* proved highly susceptible, and no indication of biologic specialization in the fungus was observed. In a further test with seven primitive forms, it was found that *Triticum monococcum* was the most susceptible, followed by *T. polonicum* and *T. durum*, while *T. spelta* proved resistant.

PETURSON (B.). **Epidemiology of cereal rusts.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 44–46, 1931.

Stationary slide exposures made in the summer of 1930 showed that no definite spore showers of *Puccinia graminis* occurred in

western Canada during June, but that a light sprinkling of spores was gradually coming in from the south. Far fewer spores were caught on the slides exposed in Manitoba during June than during the same month in 1927 and 1929 [cf. *R.A.M.*, ix, p. 439]. The first spores were caught at Saskatoon and Indian Head on 1st July and at Edmonton on 29th July. The first definite spore shower, which extended over the whole of Manitoba and eastern Saskatchewan, occurred on 14th July; on 23rd July the spore counts at all the stations east of Saskatoon increased from merely several to several hundred spores per square inch of slide, and by the 26th of the month counts of several thousand spores per square inch were quite common. Subsequently, the numbers deposited were much greater than during the corresponding period in any previous year and mostly were undoubtedly of local origin.

Relatively few spores were caught on slides exposed during aeroplane flights over Lac du Bonnet, Manitoba, during June and the first two weeks of July. A considerable increase in spore count occurred on 14th July, followed by a still greater increase on 23rd July.

Stem rust of cereals was first observed in Manitoba on 26th June, in Saskatchewan on 11th July, and in Alberta on 10th August; by 20th July it had become quite prevalent in Manitoba and eastern Saskatchewan and a severe epidemic appeared to be likely, but from then on further rust development was checked by the dry weather. Leaf rust of wheat (*P. triticina*) covered about the same area as stem rust, but was not quite so severe. Evidence was obtained of the overwintering of *P. triticina* in Alberta.

Stem rust caused no damage in Alberta or in the western half of Saskatchewan. The rust losses in 1930, although considerable in eastern Saskatchewan and Manitoba, were much lighter for the whole of western Canada than in 1927 [ibid., viii, p. 360].

Newton (Margaret), Johnson (T.), & Brown (A. M.). **The constancy of physiologic forms.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 48–51, 1931.

In genetic studies (conducted at Winnipeg) of physiologic forms of *Puccinia graminis* var. *tritici* [*R.A.M.*, x, pp. 16, 169, 365] a cross made between forms 9 and 36 produced F_1 hybrids identified as form 17. This hybrid form was selfed and 126 F_2 cultures were studied for pathogenicity on the 12 wheat differential varieties. The F_2 cultures were identified as one or another of forms 1, 11, 15, 17, 36, 57, and 85.

The cross, form 9 × form 15, produced F_1 hybrids identified as form 9. This hybrid form 9 on selfing produced F_2 hybrids identified as one or another of forms 9, 85, 57, and 15.

In several of the crosses there was evidence of the presence of a type of inheritance inexplicable on a Mendelian basis. For example, in a cross between forms 14 and 36 the hybrids arising from the form 14 side were identical with form 14, while those from the opposite side were different in pathogenicity and were identified as form 88, a new physiologic form.

Newton (Margaret), Johnson (T.), & Brown (A. M.). **The seasonal distribution of physiologic forms of Puccinia graminis var. tritici in Canada.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 46–47, 1931.

In this report of the distribution of physiologic forms of *Puccinia graminis* var. *tritici* [cf. *R.A.M.*, viii, p. 707] in Canada in 1929 the forms arising from barberries are excluded in view of the hybridization on that host and the results confined to those from cereals and grasses. Previous lists are revised on this basis.

Although 39 physiologic forms of *P. graminis* var. *tritici* were isolated in Canada between 1919 and 1929, different physiologic forms predominate in different years. From 1919 to 1921 form 17 predominated and form 21 was rare; from 1922 to 1929 form 21, on the other hand, was one of the commonest, while form 17 was very scarce. In 1925 form 36 suddenly became predominant and in 1929 it formed 22 per cent. of all collections.

Johnson (T.). **The germination of Wheat stem rust teliospores.** —*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 51–52, 1931.

This paper describes work undertaken to germinate greenhouse-formed teleutospores of certain physiologic forms of wheat stem rust [*Puccinia graminis* var. *tritici*] as soon as possible after their formation, in order that they could be used in hybridization studies [*R.A.M.*, xi, p. 164]. Teleutospores of each physiologic form were produced at 55° to 60° F. and at 70° to 75°. Soon after their formation, they were frozen in water for two to seven days at a temperature of about −5° C. They were then thawed and placed under a spray of tap water at 5° to 10° C. for seven days, after which they were tested for germination, invariably with a negative result. They were then dried in the laboratory for two days, soaked over-night in water, and again tested for germination. They commonly began to germinate after the first drying, and alternate wetting and drying was continued as required. The shortest period between the completion of teleutospore formation and the germination of the spores was twenty days; spores frequently germinated between thirty and forty days after formation. Teleutospores formed at the lower temperature tested germinated more abundantly, and more consistently, than those formed at the higher temperature.

Verwoerd (L.). **Die fisiologiese vorms van Puccinia graminis Pers. wat in Suid-Afrika voorkom.** [The physiologic forms of *Puccinia graminis* Pers. occurring in South Africa.]—*S. African Journ. of Sci.*, xxviii, pp. 274–279, 1931.

Stem rust of cereals (*Puccinia graminis*) is stated to have been first observed in South Africa in 1708, when it appeared on rye. Serious epidemics in wheat occurred in the Cape Province between 1896 and 1902, and the crop has only been saved from ruin by the introduction of the Rieti variety.

Eight forms of *P. graminis tritici* are found in South Africa [*R.A.M.*, xi, p. 164], viz., 13, 21, 29, 34, 38, 98, 99, and 100, the

three last being new; *P. graminis avenae* is represented by two forms (2 and 3), *P. graminis secalis* by two (unidentified), and *P. graminis phlei-pratensis*, *P. graminis agrostidis*, and *P. graminis poae* by one each. Form 34 of *P. graminis tritici* is extremely virulent and attacks not only wheat (Acme and Unie 52) but *Hordeum murinum* and *Dactylis glomerata* (the latter also being infected by form 99). *Bromus maximus* is liable to infection by form 100 and Kaalgars barley by 98. Burbank wheat is attacked by form 21 and Kubanka by 29 and 38; Arnautka is susceptible to 98 and 21 as well as to 34. A table is given showing the reactions of these and other varieties to the eight forms.

Form 3 of *P. graminis avenae* was found on Fulghum and Algerian oats, *Avena fatua*, and *D. glomerata*, while 2 occurs on *H. murinum*, Fulghum and Sunrise oats, *A. fatua*, *D. glomerata*, and *H. murinum*. The White Tartar variety of oats was found to be very susceptible to form 3 and Joanette to form 2, while Richland is fairly resistant to both.

GASSNER (G.) & STRAIB (W.). **Zur Frage der Konstanz des Infektionstypus von Puccinia triticina Erikss.** [On the question of constancy in the infection type of *Puccinia triticina* Erikss.]—*Phytopath. Zeitschr.*, iv, 1, pp. 57–64, 1 col. pl., 1931.

Contrary to the generally accepted beiief that the type of infection produced on a certain cereal by a given rust is constant and predominantly independent of external factors, the writers' investigations at Brunswick with form XIV of *Puccinia triticina* [*R.A.M.*, ix, p. 768; xi, p. 33] showed that some of the reputedly highly resistant standard wheat varieties become very susceptible at low temperatures (8° to 12°, minimum 6° C.) [cf. ibid., ix, p. 99; x, p. 714; xi, p. 167]. Among these were Malakoff, Norka, Democrat, Mediterranean, v. Rümker's Sommerdickkopf, Roter Tiroler Spelz, and Kanred. On the other hand, the Webster, an unnamed (C.I. 3747), and Halland varieties maintained their resistance at the lower temperatures.

ALLEN (RUTH F.). **Heterothallism in Puccinia triticina.**—*Science*, N.S., lxxiv, 1923, pp. 462–463, 1931.

Continuing her studies on sex in the rusts [*R.A.M.*, x, pp. 168, 235], the writer found that *Puccinia triticina* is heterothallic, and reports the discovery of receptive hyphae similar to the trichogynes described by Andrus in other rusts [ibid., x, p. 810]. A monosporidial infection may bear both spermogonia and receptive hyphae, but unless spermatia are brought to it from a different infection the aecidia remain haploid and gradually degenerate.

A comparative investigation of a number of young infections shows that some have many spermogonia and few receptive hyphae and vice versa, while a few have no spermogonia and an abundance of receptive hyphae. The intermediates in this series were found to be more numerous than the extremes. In one sterile infection 42 days old there were 103 spermogonia and only 23 small sterile aecidia. Another large sterile infection from the same lot con-

tained over 200 sterile aecidia and no spermogonia. The infections of *P. triticina* can be arranged in a series with an almost exclusively spermogonial type at one end and a completely aecidial type at the other.

Before fertilization the receptive hyphae, like the haploid mycelium in which they originate, consist of uninucleate cells. On fertilization the receptive hyphae at the stomata are found crowded with nuclei, of which 2 to 6 are common, while as many as 11 have been seen in a single cell. The aecidium is permeated by growth from these cells. The young fertile aecidium makes vigorous growth; it is composed of a matrix of haploid cells interspersed throughout with cells containing two or more nuclei. The aecidium undergoes differentiation into a lower half of large, vacuolated cells, which afterwards die, and an upper half of smaller, denser cells, many of them multinucleate. The number of nuclei is variable, amounting in extreme cases to 15 or 20 per cell and decreasing with further growth and cell division. The young basal cells of the sporogenous layer formed by cells growing down from the upper mass contain 2 to 8 nuclei. The extra nuclei are used to form the first spores, and by the time the spore chains are well started the basal cells are regularly binucleate. Occasionally aecidia open on the upper surface, but either fertilization of the upper receptive hyphae (which are found emerging between the epidermal cells) is rare, or else those that are fertilized grow to the lower surface before further development, a process not yet observed.

Haskell (R. J.), Leukel (R. W.), & Boerner (E. G.). **Stinking smut (bunt) in Wheat and how to prevent it.**—*U.S. Dept. of Agric. Circ.* 182, 20 pp., 9 figs., 1931.

After stating that bunt of wheat [*Tilletia caries* and *T. foetens*] causes an annual loss in the United States of some 18,000,000 bushels and that 11·5 per cent. of the 1929 crop was bunted, the authors stress the importance of thoroughly cleaning the seed and then treating it with copper carbonate (2 oz. of 50 per cent. grade or 3 oz. of 18 to 20 per cent. grade per bushel), using a commercial or home-made dusting machine, or with formaldehyde (1 pint in 40 galls.). using a machine which brings the bunt balls to the surface of the liquid, where they can be skimmed off. A field survey of spring wheat in 1930 [*R.A.M.*, x, p. 228] revealed that many farmers were not using proper methods of seed treatment.

Gordon (W. L.). **Physiologic specialization in Puccinia graminis var. avenae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 58–59, 1931.

In addition to the seven distinct physiologic forms of *Puccinia graminis* var. *avenae* isolated from collections made in various parts of Canada in 1929 [*R.A.M.*, x, p. 176], all of which were previously known to occur in the Dominion, physiologic form 8, hitherto reported only in Australia [cf. ibid., ix, p. 703], was twice isolated, once from a collection of uredosori on Monarch Strain oats at Nappan, Nova Scotia, and once from aecidia on a barberry [*Berberis* sp.] artificially inoculated in a greenhouse at Winnipeg.

Less virulent than form 6, form 8 is more virulent than the commonly found forms 1, 2, and 5. All the known physiologic forms of *P. graminis* var. *avenae* have now been isolated from Canadian collections.

PETURSON (B.). **Physiologic specialization in Puccinia coronata var. avenae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 57, 1931.

Seven distinct physiologic forms were isolated from one hundred and three collections of *Puccinia coronata* var. *avenae* [*P. lolii*: *R.A.M.*, x, p. 177] obtained from various parts of Canada in the summer of 1929. Forms 1, 4, 11, and 12 occurred fairly commonly. Of all the forms identified form 1 was the most virulent and the commonest, comprising 27·1 per cent. of the 1928 collections and 36 per cent. of those identified in 1929. It was collected from Saskatchewan to Prince Edward Island.

REED (G. M.). **Inheritance of smut resistance in hybrids of Early Gothland and Monarch Oats.**—*Amer. Journ. of Botany*, xviii, 9, pp. 803–815, 1931.

The essential features of the writer's researches on the inheritance in oat hybrids of the Early Gothland and Monarch varieties of resistance to the loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) have already been noticed from another source [*R.A.M.*, x, p. 515].

BLATTNÝ (C.). **Mazlavá sněť Žitná.** [Bunt of Rye.]—*Ochrana Rostlin*, xi, 3–4, p. 139, 1931.

The author states that rye bunt (*Tilletia secalis*) [*R.A.M.*, x, p. 372], which usually is of rare occurrence in Czecho-Slovakia, was very prevalent in 1931 on the rye variety Elite imported from Germany.

SANFORD (G. B.). **A new disease of Corn in Alberta.**—*Rept. Dominion Botanist for the year 1929, Div. of Botany, Canada Dept. of Agric.*, pp. 88–89, 1 fig., 1931.

An apparently new disease was first observed on maize in Alberta in 1927, when a number of fully grown Golden Bantam plants in the ear stage were severely blighted, several being killed; the disease reappeared in the same locality the following year.

All the parts of the plant above the ground were affected, and severe necrotic lesions sometimes extended into the cob from the surface. Apparently, the leaves were the part most severely attacked. The first indication of the disease on the green leaf is an exudate which dries, leaving a small, raised, light-coloured spot up to 1 mm. in diameter. The exudate quickly becomes surrounded by a water soaked area. There appears to be a slight tendency for the lesions to be limited by the leaf veins. Later, each spot is usually bounded by a brownish, rusty margin. The lesions, which are most numerous and pronounced on the upper surface of the leaf, may coalesce into long or irregular water soaked or rusty areas.

The disease is apparently of bacterial origin, but the cause has not yet been established.

BLATTNÝ (C.). **Fusariosa na Kukuřici (Zea mays), málo známá choroba mladých rostlin.** [Fusariosis of Maize (*Zea mays*), a little known disease of young seedlings.]—*Ochrana Rostlin*, xi, 3–4, pp. 129–132, 3 figs., 1931.

This is a brief account of a seedling blight, caused by a species of *Fusarium*, which was observed in Czecho-Slovakia in a number of maize plants of the White Tyrolese variety of Austrian origin grown in pots for experimental purposes. The fungus killed 4 per cent. of the seed before germination and 6 per cent. of the seedlings after emergence from the soil. On the stems of the latter it formed a dense, sclerotium-like mycelial overgrowth, from which the hyphae spread in a dense, white, fluffy mass over the surrounding soil. On soil extract agar the organism produced an abundance of white, fluffy aerial mycelium, without discoloration of the substratum, but beet agar was occasionally superficially discoloured pink. Pionnotes with conidia developed 36 days after inoculation of the cultures; these bodies are small, reddish-orange, and surrounded by the mycelium. Sclerotium-like formations, similar to those observed on the host plant, were also produced in pure cultures. The conidia are rather curved, with obtuse ends, one- or two-septate, and average 18·7 by 3·3 μ in diameter (extremes 13·2 to 26·4 by 1·65 to 4·4 μ); they were not observed on the host plant. The fungus, in its morphological and cultural characters, stands closest to *F. aurantiacum* [*R.A.M.*, viii, p. 772], with which it may eventually prove to be identical.

Examination of maize seed from the same lot showed that out of 300 grains 21 were infected with the species of *Fusarium* internally, indicating that infection occurred in the ears. This leads the author to recommend seed disinfection of maize imported from Austria, since once introduced the disease may prove very injurious in Czecho-Slovakia.

DUFRÉNOY (J.) & FRÉMONT (Mlle T.). **Influence de la température sur les réactions du Maïs à l'infection fusarienne.** [The influence of temperature on the reactions of Maize to fusarial infection.]—*Phytopath. Zeitschr.*, iv, 1, pp. 37–41, 5 figs., 1931.

From maize plants suffering from foot rot in the south-west of France the writers isolated a species of *Fusarium* which was identified by Wollenweber as *F. graminearum*, and a study was made of the cytological reactions induced in maize seedlings by inoculation with this parasite at low (7° C.) and high (20°) temperatures, the former accelerating and the latter retarding the course of the disease [*R.A.M.*, v, p. 247]. Subsequently the perithecial stage of the fungus (*Gibberella saubinetii*) developed on lupin stem cultures.

At the low temperature the plants develop very slowly, and the fungus forms only a scanty aerial mycelium, but rapidly sends out bundles of hyphae between the foliar sheaths and then between the cells, which remain alive for some time. The cytoplasm of the affected cells becomes spongy, forming a network of trabeculae that divide the vacuolar apparatus into a large number of small vacuoles. This phenomenon is particularly conspicuous near the nucleus,

where the hyperchromatic zone believed to be due to proteolysis resembles the 'cell inclusions' of mosaic plants. Neither these nor the adjacent cells form phenolic compounds in their vacuoles. Finally, the hyphae penetrate the interior of the cells, where they induce the formation of callosities staining with the Millon-Denigés reagent. The seedling perishes from general decay and the *Fusarium* develops luxuriantly as a saprophyte.

At 20° a very different picture is presented by the seedlings, the rapid growth of which keeps pace with that of the fungus. A profuse aerial mycelium is formed, but the hyphae are apparently unable to penetrate the living cells, which react to attempted infection by fragmentation of the vacuolar system and production in the vacuoles of phenolic compounds, accompanied in certain tissues by the development of lignified protuberances as described by Dickson.

The essential feature of the cytological reaction of maize seedlings resistant to *G. saubinetii* is considered to be the formation of phenolic (tannin) compounds, which has further been observed in various other cases [cf. ibid., vii, p. 458; ix, pp. 50, 96].

[Wallace (G. B.).] **The smuts of Sorghum and their control.**—*Tanganyika Dept. of Agric. Mycol. Leaflet* 11, 6 pp., 1931.

The following smuts of sorghum are reported to occur in Tanganyika: grain or covered kernel smut (*Sphacelotheca sorghi*), loose smut (*S. cruenta*), head smut (*Sorosporium reilianum*), and long smut (*Tolyposporium ehrenbergii*) [*R.A.M.*, ix, p. 745]. Of these, *Sphacelotheca sorghi* is by far the most common, having been found affecting 60 per cent. of 25 Bonganilho heads examined on 1st July 1931 (20 to 90 per cent. infection in individual heads). *S. cruenta* occurs to a slight extent, attacking practically all the grains in a head, while *Sorosporium reilianum* is usually negligible and *T. ehrenbergii* has not been seen recently. The following percentages of *Sphacelotheca sorghi* were observed at Morogoro Experiment Station on 8th July 1930: Kihemba-hemba variety 52, Karachi 28, Ngwana Kimba 10, Bonganilho 5, Kilinyali 1, and Sukesha 1. At the end of June 1930, when only Bonganilho and Sukesha were grown on the station, no loose or head smuts were observed, but the former showed 4·5 per cent. infection by *S. sorghi* and the latter 1 per cent. At Singida Bonganilho was reported to show 20 per cent. of grain smut in May 1931, and Kilinyali 2 per cent. *S. sorghi* appears to be particularly destructive to Bonganilho in the Singida district.

The grain and loose smuts of sorghum may be controlled by seed disinfection with 2 per cent. copper sulphate (sprinkling or 10 to 15 minutes' immersion) or 0·5 per cent. formalin (two hours). The cost of the former treatment is about 5 cents and of the latter 12 cents for 15 lb. of seed or sufficient to sow one acre. The natives of Tanganyika and Nyasaland keep the head smut in check by eating the young diseased heads.

Control of Citrus gummosis.—*Bombay Dept. of Agric. Leaflet 7 of 1931*, 2 pp., 1931.

Popular notes are given on the symptoms and control of citrus

gummosis [*Phytophthora* sp.], which is stated to be the cause of heavy losses in the Bombay Presidency, where experiments have been conducted from 1927 to 1931 to determine a suitable mode of treatment. It was found that the hyphae of the fungus cannot penetrate the resistant Jamburi stock, on which Mosambi [orange] trees should therefore be budded. Instead of piling up the soil round the trunks of the trees, especially those budded low or planted deep, a small encircling mound should be made in order to prevent both soil and irrigation water from coming into direct contact with the trunk. The excessive flooding of gardens should be avoided. Unless infection has spread round two-thirds of the trunk it may be arrested by the excision of the diseased brown bark, the application of creosote oil (25 to 30 per cent.) to the exposed wood, and painting over with coal-tar after the surface of the wound is dry.

Mold infection of fruit.—*Science*, N.S., lxxiv, 1924 (*Supplement*), pp. 12–13, 1931.

Working at the Catholic University of America, Washington, D.C., H. T. O'Neill and A. J. Harriman found that blue mould [*Penicillium italicum*] enters oranges exclusively through breaks in the skin made by clipper cuts, the workers' finger nails, box splinters, projecting nails, and the like [*R.A.M.*, xi, p. 104]. Not one out of 400 sound, whole-skinned oranges kept in a damp, dark cellar for three months was lost through mouldiness, although mouldy fruit was kept among them to ensure sources of infection. In order to facilitate the detection of the microscopic scratches which are overlooked in grading, it is necessary to apply a metallic salt capable of reacting with the tannin in the subepidermal tissues and forming a dark, conspicuous streak. Ferric chloride has been found particularly suitable for this purpose, immediately making minute abrasions visible as dark lines while leaving sound fruit unmarked. The salt is removed by washing the fruit in clear water. This process obviates the use of borax which acts as a preventive of infection [ibid., x, p. 728], but is open to various objections on hygienic grounds.

Stahel (G.). **Zur Kenntnis der Siebröhrenkrankheit (Phloemnekrose) des Kaffeebaumes in Surinam. I. Mikroskopische Untersuchungen und Infektionsversuche.** [Contribution to the knowledge of the sieve-tube disease (phloem necrosis) of the Coffee tree in Surinam. I. Microscopic investigations and inoculation experiments.]—*Phytopath. Zeitschr.*, iv, 1, pp. 65–82, 8 figs., 1931.

Phloem necrosis is stated to be by far the most serious disease of Liberian coffee in Surinam [*R.A.M.*, x, p. 377], where it has been known to occur for upwards of thirty years, while the statement of P. Fermin in 1770 as to the desiccation and dying-off of entire fields of Arabian coffee is thought probably to refer to the same disturbance. The disease is found in all parts of the colony, even in isolated plantations. In British Guiana the so-called 'wilt' disease is responsible for the sudden withering and death of single bushes or groups in the midst of otherwise healthy fields [ibid., ix,

p. 288]. Excepting these two countries phloem necrosis appears to be unknown in coffee-growing areas.

After reviewing the scanty previous literature on the disease, the author describes the anatomical features of the disease [loc. cit.], which reappeared with extraordinary severity in 1930. It was equally prevalent on permeable sand and heavy clay. The average annual loss from phloem necrosis is estimated at 1 to 3 per cent. of the bushes, but in some plantations the loss may reach 10 or even 25 per cent. in years of severe infection.

The examination of root and stem sections, fixed and stained with equal parts of 6 per cent. potassium bichromate, 1 per cent. chromic acid, and 2 per cent. osmic acid, disclosed the regular presence in the necrotic sieve-tubes of small, spherical bodies of irregular contour, staining brown with osmic acid, which were absent from healthy material. In the sieve-tubes showing multiple division large numbers of black, fusiform bodies with apical flagella were detected; with the aid of Giemsa's stain these were found to contain nuclei. It was evident from these features that the organism in the necrotic sieve-tubes was a species of *Phytomonas* [*Leptomonas* of Lafont and França: ibid., i, p. 309] closely resembling *P.* [*L.*] *davidi*, which is prevalent in the latex of various Euphorbiaceae, chiefly in the tropics and subtropics [ibid., iv, p. 701; v, pp. 183, 760]. However, the coffee flagellate measures only 6 to 10 μ in length and 0·4 to 0·6 μ in breadth (occasionally 3 to 4 or 16 μ long and 0·2 to 1·2 μ broad) compared with 18 by 1·6 μ for *L. davidi*. Here and there subspherical forms occur which shed their flagella and thus constitute a transition to *Leishmania*; these are probably the forerunners of the above-mentioned degeneration forms in the dead sieve-tubes. The blepharoplast of the coffee flagellate is rod-shaped in contrast to that of *L. davidi*, which is globular. The flagellate was present in large numbers on 22nd April, 1931, i.e., about a month before the appearance of definite necrotic symptoms, in all the sieve-tubes of the soft bast in the diseased roots of a bush artificially inoculated by grafting on 30th December, 1930.

Attempts to culture the coffee flagellate on blood agar gave negative results. Fixation was best effected by Duboscq's method (picric acid-formalin-acetic acid-alcohol), and staining with Heidenhain's haematoxylin and Giemsa's solution. The organism is named *P. leptovasorum* n. sp.

The first inoculation experiments in the recent studies, like those of 1920, were based on the assumption that a filterable virus was responsible for phloem necrosis, and were carried out chiefly by grafting diseased shoots on healthy trees. All these tests gave negative results. On 30th August and 6th September 1930, three to four diseased roots, 30 to 40 cm. long, were grafted on each of 24 bushes; early in December nine more bushes, and on 30th December one more, were similarly treated. In the middle of February, 1931, 9 of the first lot of 24 bushes suddenly became diseased, 5 of the 9 treated early in December followed in the first week of May, while the bush treated on 30th December showed necrotic symptoms at the end of May. These results are considered to demonstrate the infectious character of the phloem

necrosis of coffee. *P. leptovasorum* was found in the sieve-tubes of all the experimentally infected bushes, its pathogenicity towards which can scarcely be doubted, though conclusive proof must await the successful isolation of the organism in pure culture.

Until the mode of transmission and alternate hosts of the agent of phloem necrosis are known, no rational scheme of control can be devised. Planters have been advised to eradicate diseased bushes as soon as the first external symptoms appear. The observation that bushes in plantations liable to flooding are scarcely affected by phloem necrosis suggests that the repeated inundation of severely infested fields might be beneficial.

KIRKPATRICK (T. W.). **Further studies on leaf-curl of Cotton in the Sudan.**—*Bull. Entomol. Res.*, xxii, 3, pp. 323–363, 2 pl., 1 diag., 1931.

After briefly stating the reasons that lead him to adopt the name 'leaf curl' for the virus disease of cotton in the Sudan, a preliminary report on which has already been noticed [*R.A.M.*, x, p. 18], and the symptoms of which may be, according to the varieties affected, a definite curling of the leaf margins, either upwards or downwards, a peculiar crinkled appearance produced by net-vein enations (the most characteristic feature on Sakel cotton), or mosaic in the form of chlorotic spots, the author gives a very full account of continued experiments, under controlled conditions, on the transmissibility of the disease. The results showed that the whitefly *Bemisia gossypiperda* (which transmitted the disease to healthy Sakel cotton plants in 157 out of 168 tests) is a very efficient, and in all probability the only vector of the disease, since attempts to transmit it by means of *Aphis gossypii* and of the jassid *Empoasca fascialis* gave negative results in every case. The whitefly can pick up the virus from those parts of an infected plant that show no symptoms of the disease, but it is still doubtful whether it can do so on inoculated plants before the symptoms have developed on the latter. Adults that develop from larvae grown on diseased cotton plants are infective without having to feed in the instar stage on infected plants. Once infected, the whitefly remains capable of transmitting the disease during at least 7 days, and probably throughout its life. The virus is picked up by the adult insect in just over 3 hours (possibly even less), but full infectivity is apparently attained only after a minimum stay on the source of infection of four and a half hours. The disease is transmitted to healthy plants in 30 minutes, and the whole process of infection of the insect and of the healthy plant has been accomplished in 6 hours 30 minutes. The virus is not transmitted through the egg of the whitefly.

There was a large amount of negative evidence that the disease is not transmissible through the seed of Sakel cotton or through the soil. The incubation period of the virus in the cotton plant varied from 8 to 34 days, but the great majority of the recorded periods were between 11 and 19 days. There was some indication that shading the inoculated plants, especially in conjunction with a low soil temperature, may retard the incubation period or the rapid development of the symptoms; the age of the plant did not

appear, however, to have any bearing on the duration of incubation. Little is known with certainty concerning the factors that influence the severity of the disease, but occasionally the symptoms did not develop until brought out by 'topping' the plants. Partial recovery of diseased Sakel cotton plants in the fields is not infrequent, and at least one case of complete recovery appears to have been observed. Out of three strains of Sakel cotton selected for resistance to the disease, two showed a high degree of comparative resistance, and a greater tendency to recover than ordinary strains.

Further experiments showed that the disease is readily transmitted by *B. gossypiperda* from Sakel cotton to bamia (*Hibiscus esculentus*), til (*H. cannabinus*), and karkade (*H. subdariffa*), on which the symptoms resemble fairly closely those on Sakel. The virus is readily transmitted back from til to Sakel, but direct retransmission from bamia to Sakel has not yet been obtained; indirectly this has, however, been accomplished by passing the virus from bamia to til and thence to Sakel. The disease has also been observed in nature on garden hollyhocks, and a very similar one, with leaf curling, vein thickening, and foliar enations, occurs on tomatoes in Khartoum and the Gezira.

On the American Watts Long Staple cotton the disease when transmitted from Sakel by the whiteflies (needle inoculations gave negative results) develops in the form of a conspicuous mosaic, with none of the ordinary crinkle symptoms, except occasionally very faint traces which do not persist. The whitefly also readily transmits this mosaic to healthy plants of the same variety. No cases of complete recovery from mosaic were observed, but partial recovery is not uncommon. Attempts to transmit the leaf curl disease from bamia by means of the insect did not produce any symptoms on Watts Long Staple cotton, but typical mosaic developed when the plants were colonized with whiteflies from diseased til. Although healthy Sakel plants, to which whiteflies from mosaic Watts Long Staple cotton were transferred, did not develop either crinkle or mosaic, evidence of the presence in them of the virus in a masked form was obtained from the fact that typical mosaic developed when whiteflies were transferred from them to healthy Watts Long Staple plants.

A list is given of a number of other varieties of cotton which were tested in the experiments. Some developed crinkle only, some mosaic only, and a few showed symptoms of both crinkle and mosaic in the same plant; on some, however, particularly Asiatic cottons, no symptoms were produced, and there was no indication that such plants behaved as carriers.

Observations on leaf curl in the Gezira indicated that during the 1930–31 season it spread earlier and faster, and its intensity was more severe than in the previous year, the loss caused by it being estimated at from one-half to one kantar per feddan. Apart from the development of resistant cotton varieties, the disease can only be effectively controlled by the suppression of the whitefly vector or of the initial source of infection early in the season. It is believed that the virus is carried from year to year mainly in the ratoon cotton plants which survive the 'dead' season and the

new growth on which is almost always crinkly, and steps are being taken to eradicate this source of infection.

McNamara (H. C.), Hooton (D. R.), & Porter (D. D.). **Cycles of growth in Cotton root rot at Greenville, Tex.**—*U.S. Dept. of Agric. Circ.* 173, 17 pp., 8 diags., 1931.

In continuation of the investigations of the cotton root rot disease (*Phymatotrichum omnivorum*) at the United States Cotton-breeding Field Station at Greenville, Texas [*R.A.M.*, ix, p. 306; cf. xi, p. 170], the authors discuss in some detail the behaviour of individual infection spots, mapped out from season to season since 1920. The spots pass through a period of some years of sustained development, and then in a single season break up into a few small isolated points, this process having no obvious relationship to the nature of the soil, the season, or the crop grown, but being apparently due to the behaviour of the causal fungus itself, possibly associated either with the life-history of the latter or some peculiar environmental conditions not yet understood. The small isolated points resulting from the breaking up serve to carry over the infection, and usually restart the latter with increased vigour. One of these isolated points of infection was apparently eradicated by digging out the diseased plant roots and the surrounding soil to a depth of 26 inches, and exposing the infected material to weathering on the surface of a disease-free area.

It is pointed out that the breaking up of the large spots indicates a weak point in the life of *P. omnivorum* and presents a favourable opportunity for the application of soil disinfectants and the planting of non-susceptible crops for several seasons with a view to reducing infection.

Holman (H. P.) & Jarrell (T. D.). **Waterproofing and mildew-proofing of Cotton Duck.**—*U.S. Dept. of Agric. Farmers' Bull.* 1157, 9 pp., 15 figs., 1931.

Mildew and sunlight are stated to be the chief causes of deterioration in cotton duck or canvas in the United States, where untreated material always mildews in warm weather if stored wet or even slightly damp. The resistance to mildew of the canvas may be increased by various treatments [*R.A.M.*, x, p. 733] tending to reduce the absorption of water, one coat of any of the following applied to each side having proved satisfactory: (1) 8½ lb. petrolatum (vaseline), 1½ lb. yellow refined beeswax, 5 lb. dry earth pigment (ochre, sienna, or umber), and 5 galls. volatile mineral spirits (painters' naphtha); (2) 7½ lb. medium hard petroleum asphalt, 2½ lb. vaseline, 1 lb. dry lamp-black, and 5 galls. mineral spirits; (3) 1 gall. boiled linseed oil, 2 lb. lamp-black, ground in linseed oil, and 1 pint Japan drier; (4) 1 gall. linseed oil, 1 lb. aluminium bronzing powder, and ½ pint Japan drier; (5) ½ lb. beeswax and 1 gall. spirits of turpentine.

Galloway (L. D.). **The formation of 'diamond spot' stains by mildew fungi.**—*Journ. Textile Inst.*, xxii, 10, pp. T494–T496, 5 figs., 1931.

This is a brief account of experiments which showed that the

'diamond' formation of mildew spots on cotton woven fabrics is not characteristic of any particular organism (a number of which were tested, including species of *Cladosporium*, *Helminthosporium*, *Fusarium*, *Aspergillus niger*, and *A. terreus* [cf. *R.A.M.*, x, p. 597]), and most probably depends on the weave of the cloth, the organisms growing more rapidly along the warp and weft than across the open spaces. This spot only occurred when the fabric was thoroughly damp and was incubated in a saturated atmosphere.

PETCH (T.). **New species of fungi collected during the Whitby foray.**—*The Naturalist, 1931*, pp. 101–103, 1931.

The new genus *Hymenostilbe*, represented by *H. muscarium* n. sp. on flies, is characterized by cylindrical clavae, parallel, joined, composite hyphae, usually not branched, cylindrical or clavate basidia, with a short sterigma (about 0·5 μ high) at the apex; and hyaline, continuous, single or occasionally concatenate conidia.

Notes on, and diagnoses of, the following are also given: *Sporotrichum isariae* n. sp. parasitic on *Isaria farinosa*; *Cephalosporium* (*Acrostalagmus*) *muscarium* n. sp. on flies attached to living leaves; *C. dipterigenum* n. sp. on a fly attached to a living leaf; *Spicaria* (*I.*) *swantoni* comb. nov. on bees.

CHEVALIER (A.) & DUFRÉNOY (J.). **Destruction du borer du Caféier (Apate monacha) par un champignon parasite.** [Destruction of the Coffee borer (*Apate monacha*) by a parasitic fungus.]—*Rev. de Bot. Appliquée, et d'Agric. Trop.*, xi, 120–121, pp. 738–740, 2 figs., 1931.

The senior author states that on the Ivory Coast of West Africa he frequently found adult individuals of the coffee stem-borer (*Apate monacha*) killed inside the galleries in the host by a parasitic fungus which, as described by Dufrénoy, is close to the genus *Spicaria*. It is characterized by long, tapering conidiophores bearing conidia measuring 8 to 10 by 3 to 4 μ and arranged in chains.

ALATORZEFF (A. P.). **Zur Frage der Dermatomykosis, hervorgerufen durch 'Torula epizoa Corda'.** [On the question of dermatomycosis caused by *Torula epizoa* Corda.]—*Arch. für Dermatol.*, clxiv, 2, pp. 279–284, 2 figs., 1931.

Torula epizoa Corda, which is characterized by concatenate hyphal segments of irregular diameter and round, yellowish spores, 6·5 to 8 μ in diameter, was isolated by the writer from the heads of two children in Leningrad suffering from trichophytosis of the scalp due to *Trichophyton tonsurans violaceum* [*T. violaceum*: *R.A.M.*, xi, p. 44]. In addition to the usual clinical picture of trichophytosis, small, flat, pink nodules were observed, presumably due to the associated *Torula epizoa*. The latter organism was also found causing a mild eruption of the skin of two dogs.

Sternberg (C.). **Zur Kenntnis der Aktinomykose des Gehirns.** [Contribution to the knowledge of cerebral actinomycosis.]—*Zeitschr. für Hygiene- und Infektionskrankh.*, cxiii, 1 pp. 151–159, 6 figs., 1931.

Full clinical details are given of a case of primary cerebral actinomycosis examined by the author. The condition is stated to be extremely rare, only three other cases having been definitely assigned to this cause. The cyst in the third ventricle contained glandular, clavate, biscuit-shaped, or irregular structures, staining with eosin and Gram-positive, 40 to 120 μ in diameter, and uniting to form rosette-shaped, cruciform, or wheel-shaped bundles, interspersed with isolated remnants of the furcate hyphae of an *Actinomyces*. The fungus was evidently in a state of degeneration, of which glandular development is characteristic.

Fróes (H. P.). **Mycetoma pedis (Madura foot) and its incidence in Brazil.**—*Journ. Trop. Med. & Hygiene*, xxxiv, 22, pp. 376–378, 2 pl., 1931.

The following fungi have been identified as causative agents of *Mycetoma pedis* in Brazil: *Nocardia* [*Actinomyces*] *bovis* [*R.A.M.*, x, p. 381] (the most frequent), *N. madurae*, *N. somaliensis*, *N. jenesii* n. sp. (isolated by the writer in 1930 and characterized by very numerous, hard, red grains, 150 to 300 μ in diameter), *N. bahiensis*, *N. brasiliensis*, *N. pelletieri* n. sp. (hard, rouge vermilion grains, 400 to 500 μ in diameter), *N. africana* n. sp. (very hard, carmine red grains, 250 to 500 μ in diameter), *Indiella brumpti* [ibid., vi, p. 612], *Scedosporium apiospermum* [ibid., ix, p. 782], *S. magalhaesi*, *Madurella oswaldoi*, and *M. ramiroi*. Notes are given on the clinical and diagnostic aspects of the disease.

Neves (A.). **Sobre um hiphomiceto isolado de lesões esporotrichoides da face: Spondylocladium atro-olivaceum n. sp.** [On a Hyphomycete isolated from sporotrichoid lesions on the face: *Spondylocladium atro-olivaceum* n. sp.]—*Mem. Inst. Oswaldo Cruz*, xxv, 4, pp. 323–331, 2 pl., 1931.

From the ulcerated facial lesions of a chauffeur who had met with a motor accident, the writer isolated a species of *Spondylocladium* characterized by deep olivaceous, finally black, smooth colonies; dark chestnut, septate, erect conidiophores, 34 to 55 μ in length; and dark chestnut, clavate, fusiform, ovoid or subovoid, 4-septate conidia, measuring 7 to 19·5 by 2 to 5 μ. The fungus, the cultural characters of which are given in some detail, is named *S. atro-olivaceum* n. sp., its relationship with *S. fumosum* and *S. atro-virens* [*R.A.M.*, viii, p. 804] being shown by means of a table.

Reiss (F.). **Moniliasis cutis profunda.**—*China Med. Journ.*, xlv, 11, pp. 1037–1040, 2 pl, 1931.

Attention is drawn to the recent occurrence at a girls' home in Shanghai, of an epidemic of moniliasis affecting some 24 individuals at once. An undetermined species of *Monilia* was isolated from scrapings from lesions in the popliteal region at the back of the knees—the only part of the body involved. This is stated to be the first record of the occurrence of moniliasis in China, and it

is further of interest on account of the detection of the fungus in the deep strata of the skin [cf. *R.A.M.*, x, p. 663].

Van Hell (W. F.). **Onderzoekingen over ziekten van Lelies.** [Investigations on Lily diseases.]—*Thesis, Univ. of Utrecht*, 116 pp., 4 pl., 9 figs., Baarn, Hollandia-Drukkerij, 1931. [English summary.]

A full description is given of a root and bulb rot of lilies occurring in Holland, the symptoms of which correspond in the main to those of the root decline of daffodils [*Narcissus pseudonarcissus*] and narcissi [*N. poeticus*] caused by *Cylindrocarpon radicicola* [*R.A.M.*, x, p. 795]. Diseased plants of *Lilium speciosum* vars. *album*, *roseum*, *rubrum*, and Melpomene, *L. umbellatum* and its varieties, *L. tigrinum*, *L. regale*, *L. croceum*, and others are stunted with abnormally small, pale green leaves, curling downwards, and poorly developed root systems. In advanced stages of infection the stems shrivel from the base upwards and the lowest leaves fall. The bulb scales are disintegrated and entirely rotted at the base. The roots are attacked in the early spring, the decay extending to the base of the bulb and thence to the disk and scales. If these bulbs are replanted the following year the disk is unable to form new roots, and the growing top produced during the rest period can only live for a short time on the stored reserves.

In addition to *C. radicicola*, the diseased roots and bulbs yielded various species of *Fusarium* and other fungi. Inoculation experiments [which are fully described] were carried out on several species of lily with *C. radicicola* from lily and daffodil, *Corticium solani*, and *F. solani*, of which the first-named was found to be definitely parasitic, the second may be so in certain cases, while the third is apparently saprophytic.

Cylindrocarpon radicicola (hyphae and chlamydospores) was found in the roots, disk, scales, and stem. The host cells react to the advance of the hyphae by the formation of conical papillae, surrounding the penetrating hyphae. When young, these papillae (the previous literature on which is summarized) consist of cellulose; subsequently they show typical cork and wood reactions.

Preliminary experiments in soil sterilization with formalin, as recommended by Gerretsen and his collaborators [ibid., x, p. 797], gave very satisfactory results, as did also laboratory tests in which one-year-old *L. regale* bulbs were immersed for 30 minutes in 2 per cent. formalin.

The so-called 'vuur' (blight), a destructive lily disease prevalent in Holland during cold, wet, spring weather, is due to *Botrytis elliptica* [ibid., xi, p. 108]. A non-sclerotial strain of *B. elliptica* was described by Marshall Ward as the cause of a lily disease (*Ann. of Botany*, ii, p. 319, 1888), and a similar strain was found by Miss Westerdijk and van Beyma thoe Kingma in Holland. The author, however, isolated from the affected plants examined by him a sclerotium-producing strain agreeing with that described by Wright [ibid., viii, p. 107]. Inoculation experiments with both strains on *L. regale*, *L. candidum*, *L. umbellatum* vars. *erectum* and Sappho showed that the one forming sclerotia is the more

virulent. *B. hyacinthi* caused severe infection of *L. candidum* [ibid., viii, p. 41].

Yellow flat occurs in Holland chiefly on *L. longiflorum* vars. *giganteum* and *formosum* imported from Japan via England [ibid., x, p. 668]. Various types of mosaic have been observed on *L. longiflorum*, *L. auratum*, and *L. speciosum*. The symptoms of both these diseases are described. The measures recommended for their control include roguing of infected plants, selection of healthy seed, destruction of aphids, and sanitary methods of cultivation.

A bibliography of 87 titles is appended.

HICKS (A. J.). **Gladiolus diseases.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 19–20, 1 pl., 1931.

An apparently serious infection of gladiolus corms by a *Botrytis* has been common in recent importations into Ottawa. The lesions [six types of which are clearly figured] are very typical, being straw-coloured at the centre, the colour deepening to brown at the outside, while the surface resembles a dried, tightly stretched skin, generally with a hole or crack showing where the diseased tissue has shrunk away from the suberized wall that usually separates the diseased from the healthy tissue. Black sclerotia 1 to 4 mm. in diameter are often present on the surface of the lesions. The causal organism has been isolated and is being studied.

MACLEOD (D. J.). **Aster wilt and Aster yellows investigations in disease resistance.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 22–23, 1931.

In 1930, 77 strains of asters were grown in New Brunswick in soil heavily infected with the wilt fungus (*Fusarium conglutinans* var. *callistephi*) [*R.A.M.*, ix, p. 510] and five of them, from Wisconsin, remained completely resistant. Of the others, the red strains appeared to be more resistant than the white, pink, and purple types.

FISHER (R.). **Eine wenig beachtete Dahlienkrankheit.** [A little-heeded Dahlia disease].—*Neuheiten auf dem Geb. des Pflanzensch., 1931*, 5, pp. 130–132, 1931.

In October, 1930, and July, 1931, the writer received for examination from Upper Austria specimens of dahlia leaves attacked by *Entyloma dahliae*, the symptoms, mode of infection, and control of which are briefly described. The first record of the fungus in South Africa is stated to date from 1911, and it has since been found in France, Belgium, Holland, Germany [and Switzerland: *R.A.M.*, ix, p. 409]; the writer has further detected its presence in Moravia [Czecho-Slovakia].

PAPE (H.). **Mosaikkrankheit bei Rhododendron.** [Mosaic disease of Rhododendron.]—*Gartenwelt*, xxxv, 45, p. 621, 1931.

Rhododendron leaves recently submitted to the writer for examination showed the typical blistering and mottling associated with mosaic in various other plants, but apparently not hitherto recorded on this particular host.

NEWTON (W.). **Infectious chlorosis of Roses.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 23, 1931.

During 1930, the symptoms of infectious chlorosis of roses [*R.A.M.*, ix, p. 385] did not appear in the field in British Columbia until the plants were well developed, but under greenhouse conditions they were visible much earlier, the characteristics upon Manetti roses being distinct from those upon Ulrich Brunner and Mrs. J. Laing. No symptoms of the disease were induced in Thornless Multiflora and Canina stocks through living unions with diseased Manetti, but La France bud shoots became infected through living unions with Multiflora when the latter were borne upon diseased Manetti root stocks. Diseased cuttings remained infected after one hour's immersion in water at 45° C. and after fifteen minutes' immersion in one per cent. potassium permanganate.

MADDEN (G. O.). **Verticillium wilt of Roses.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 24–25, 1 fig., 1931.

Verticillium wilt of roses was first observed in a local nursery in Ontario in 1928, since when the disease has attacked climbing and bush roses in various parts of the Niagara Peninsula. There may be severe defoliation and killing-back of the main branches and laterals or the leaves or only a few stems may wilt and fall. Isolations from stems and roots of affected plants almost invariably gave a *Verticillium*, root and stem inoculations with which gave positive results. The species was not identified, but as it produces sclerotia it belongs to the *V. dahliae* group [*R.A.M.*, xi, p. 130], and is probably a strain of *V. ovatum* Berkeley and Jackson [ibid., v, p. 564; ix, p. 6].

PAPE (H.). **Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen.** [The practice of control of diseases and pests of ornamental plants.]—x + 361 pp., 8 col. pl., 268 figs., 4 diags., Paul Parey, Berlin, 1932.

In this book the author has sought to place on a scientific basis the practical measures to be taken by nursery-gardeners in the control of the diseases and pests of ornamental plants (including flowering shrubs and trees for parks and roadways). The work is divided into two sections, viz., I (general), dealing with the economic importance and etiology of the diseases and pests of ornamentals, and their control by cultural, biological, and technical methods; and II (special), in which descriptive notes are given on (A) the general parasites (attacking numerous species and genera of plants); and (B) the diseases and pests of individual ornamentals in alphabetical order of the plants. The bulk of the treatise (from p. 108 onwards) falls under section IIB.

The book is illustrated by excellent coloured plates and a number of the text figures are original. A four-page bibliography, an index of scientific names, and an alphabetical subject index are appended.

SAMPSON (KATHLEEN). **The occurrence of snow mould on golf greens in Great Britain.**—*Journ. Board Greenkeeping Res.*, ii, 5, pp. 117–119, 1931.

During the past ten years the writer has examined samples of diseased turf (*Poa annua* and *Agrostis stolonifera*) from twelve different districts in the British Isles, and in six cases *Fusarium nivale* (*Calonectria graminicola*) was isolated from the brown patches ranging from an inch to a foot or more in diameter [*R.A.M.*, iv, p. 162]. This is believed to be the first record of the snow mould attacking grasses in England. The disease has been observed chiefly during the months October to February, but was once noticed at Bingley (Yorks) in June, 1931. Other fungi found associated with damage to lawns in England are a species of *Rhizoctonia*, probably identical with that causing brown patch in the United States [*Corticium solani*: ibid., x, p. 35], and *C. fusiforme*, which produces a burning effect on the grass [ibid., iii, p. 259].

HURST (R. R.). **The resistance of varieties and strains of Clovers to mildew.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 183–184, 1931.

Powdery mildew of clovers (*Erysiphe polygoni*) has been found in every province in Canada and is particularly troublesome in Prince Edward Island each year. One year's observations of the reactions of 37 strains of red clover [*Trifolium pratense*] to the disease showed that 16 of them possessed definite resistance, strains 5 and 6 (from Quebec) being almost immune. A low-growing type from Oregon exhibited a high degree of tolerance, while the European varieties tested were quite resistant [*R.A.M.*, viii, p. 176].

SANFORD (G. B.). **A study of the root rots of Sweet Clover in Western Canada.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 182, 2 figs., 1931.

In Western Canada part at least of the so-called winter killing of sweet clover [*Melilotus alba*: *R.A.M.*, vii, p. 302], common clover, and lucerne is caused by *Plenodomus meliloti* [ibid., x, p. 110]. The disease caused by the fungus is named 'brown rot' from the characteristic brown colour of the lesions in order to distinguish it from the softer, colourless rot produced by *Sclerotinia trifoliorum*. The latter has been found to be more serious in Alberta than first anticipated.

PAILLOT (A.). **Le traitement méthodique et rationnel des arbres fruitiers dans la région lyonnaise et les régions limitrophes.** [The systematic and rational treatment of fruit trees in the vicinity of Lyons and the adjacent districts.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 28, pp. 951–954, 1931.

Under the joint auspices of the Chambers of Agriculture, the

agricultural bureaux, the agricultural services of the P.L.M. Railway Company, the agricultural syndicates, and the Station of Agricultural Zoology of the South-East, numerous very successful public demonstrations of the writer's method of combating the fungous and insect pests of fruit and walnut trees [*R.A.M.*, x, pp. 36, 214] have been given during 1931 in Rhône, Loire, Auvergne, and Isère. Pamphlets explaining the Bordeaux anthracene oil treatment have also been issued by the regional authorities, and an exhibition of motor spraying and dusting apparatus was held at Vienne in November. Plans have been made for the continuation and extension of the campaign during the coming year.

CUNNINGHAM (G. H.). **Silver-leaf disease in the orchard.**—*New Zealand Journ. of Agric.*, xliii, 5, pp. 324–326, 1 fig., 1931.

After stating that in recent seasons silver leaf disease [*Stereum purpureum*] has become a serious problem in New Zealand orchards, most probably because the fruit-growers neglect the precautions recommended for its control, the author gives a brief, popular outline of the life-history of the causal fungus and of the measures best adapted for its suppression, based on the work of Brooks and his collaborators [*R.A.M.*, v, p. 502 ; xi, p. 59].

The fact that broom [*Cytisus scoparius*], which is abundant in most fruit districts, willows, poplars, tagasate [*C. proliferus*], and species of *Acacia* are readily infected by the fungus, makes the eradication of the sources of infection quite impracticable and protection must therefore be given by the dressing of wounded surfaces, for which purpose coal tar is stated to have given good results.

WEST (C.). **The cold storage of Apples.**—*Journ. Min. Agric.*, xxxviii, 6, pp. 585–593, 2 pl., 3 graphs, 1931.

This is a summary review of the work so far done in England in connexion with the low temperature and gas (artificial atmosphere) storage of apples, with more particular reference to the Bramley's Seedling variety. Most of the information given has already been noticed from time to time in this *Review*.

OSTERWALDER (A.). **Die Nectria-Kelchfäule an Aepfeln.** [The *Nectria* calyx rot of Apples.]—*Gartenbauwissensch.*, v, 5, p. 469, 1931.

In the autumn 1930, Golden Pearmain, Champagne Reinette, Overdiek's Reinette, and Boiken apples [in Switzerland] were found to be infected by a calyx rot due to a species of *Nectria* with spores closely resembling those of *N. galligena*, which had previously been observed on isolated fruits in 1914 and 1915. The only apparent difference in dextrose agar cultures lay in the somewhat shorter conidia with fewer septa of the calyx-rotting strain. In inoculation experiments the latter infected both wounded and unwounded fruits, whereas *N. galligena* was pathogenic only on injured apples. The calyx-rotting strain further produced cankers on one-year-old shoots of the Virginian Rose variety. Calyx rot was observed on Beauty of Boskoop and Glocken

apples in cold storage. The calyx-rotting organism is considered to be a strain of *N. galligena*, the exceptional virulence of which may be attributable to the very wet summer of 1930 [cf. *R.A.M.*, ix, p. 669].

BERG (A.). **The causative organism of a papular type of Apple measles.**—*Science*, N.S., lxxiv, 1924, pp. 485–486, 1931.

The writer's attention was first drawn to a papular type of apple measles [*R.A.M.*, ix, p. 157] in West Virginia in 1915, when only a few Red Astrachan trees were affected. The trunks and larger limbs presented a scurfy appearance, while the younger twigs, especially the water sprouts, were covered with small, well-defined papules. Negative results were given by all attempts to isolate an organism from these papules.

Frequent visits to the affected orchard each year since the first detection of the disease have enabled the writer to trace its spread from the Astrachan to the predominating Rome variety, passing over interplantings of Gano, Transparent, Chenango, Pound Royal, and Summer Queen. Two years ago the orchard was abandoned owing to the death of 16,000 trees from measles.

In 1929 a study was made of the disease in the Kanawha orchard, where the papular type was prevalent on Red Astrachan. Small Red Astrachan and Stark's Delicious trees, planted near large infected Red Astrachans, became severely infected the first season, but no causal organism could be isolated from the diseased material. In 1930, however, 34 out of 44 new papules on Red Astrachan yielded pure cultures of a slow-growing fungus which sporulated on oatmeal or malt-extract agar. Successful artificial inoculations were obtained in the greenhouse on young Red Astrachan trees during the past winter, and the fungus was readily reisolated from the lesions produced. Diseased apple twigs collected on 20th June, 1931, were placed in a moist chamber for 24 hours and spores were obtained by scraping the surface of the older lesions. The examination of freehand sections of the diseased spots showed the fungus to be a species of *Clasterosporium*, as yet undetermined.

MCLARTY (H. R.) & ROGER (J. C.). **Perennial Apple canker survey in the Okanagan Valley.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 108–111, 1931.

A survey to ascertain the distribution and severity of perennial canker of apples (*Gloeosporium perennans*) [*R.A.M.*, ix, p. 433; x, pp. 193, 675] in the Okanagan Valley, British Columbia, was begun in the autumn of 1928 and completed during the winter of 1929–30. The results obtained [which are tabulated] showed that the disease was most extensive and severe in the northern areas, and caused most damage in orchards which suffered from frost injury. The woolly aphis [*Eriosoma lanigerum*] was found throughout all the districts visited, except one where the absence of the disease, in spite of the coldness of the winters, substantiated the view that perennial canker can only exist where woolly aphis is present. The total number of trees infected, even slightly, was

less than 5 per cent., and since the completion of the survey control measures have materially reduced this figure.

Scott (C. E.) & Stout (G. L.). **Tranzschelia punctata on cultivated Anemone in the Santa Clara Valley.**—*Monthly Bull. Dept. of Agric. California*, xx, 10–11, pp. 648–654, 2 pl., 1931.

Inoculation experiments [details of which are given] with aecidiospores of *Puccinia pruni-spinosae* [*R.A.M.*, xi, p. 186] from *Anemone coronaria* on almond, apricot, cherry, nectarine, peach, plum, and prune leaves resulted in the development of the uredo stage on all the hosts except cherry (seven varieties of which were tested). No teleutospores developed on the infected leaves. In certain parts of California the teleuto stage of the rust seems to predominate over the uredo, e.g., in the Santa Clara Valley on prunes, while in the Sacramento Valley the uredo stage occurs in epidemic form on peaches. It would appear from the writers' observations that the aecidial stage is probably more common on the Pacific Coast than has been generally supposed. *A. coronaria* was very severely attacked in 1931, the leaves being abnormally thickened, puffy, and rigid, and dying prematurely, so that the roots were weakened and useless for planting stock.

Dippenaar (B. J.). **Anthracnose of Almonds caused by Gloeosporium amygdalinum Brizi.**—*S. African Journ. of Sci.*, xxviii, pp. 267–273, 1 pl., 1931.

The writer's investigations on the anthracnose disease of almonds (*Gloeosporium amygdalinum*) in South Africa have already been noticed from another source [*R.A.M.*, xi, p. 115].

Willison (R. S.). **Peach canker investigations.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 116–120, 2 graphs, 1931.

In 1930, isolations were made from cankers of various ages on peach trees in the district of Niagara, Ontario. Young and incipient cankers on old trees yielded *Sclerotinia americana*, but in no case was this fungus found in cankers more than two years old. Several other organisms were isolated but only *S. americana* produced symptoms typical of canker in inoculations of fresh wounds on both young and old wood. A high percentage of cankers in young orchards (82 per cent. in one instance) were ascertained to originate from wounds and stubs due to careless pruning.

Smith (C. O.). **Pseudomonas prunicola and Bacterium citriputeale.**—*Phytopath.*, xxi, 11, p. 1091, 1931.

The growth on dextrose-potato agar of a culture of *Pseudomonas prunicola* supplied by Wormald [*R.A.M.*, xi, p. 58] is stated closely to resemble that of the citrus blast organism, *Bacterium* [*P.*] *citriputeale*, and inoculations with the former through wounds in nearly ripe lemon fruits kept in a moist chamber produced within ten days typical black, pitted lesions identical in appearance with those caused by *P. citriputeale*, *Bact.* [*P.*] *syringae*, and *Bact.* [*P.*

cerasi isolated from California material. *P. prunicola*, therefore, is evidently very similar to, if not identical with, the organisms in question.

BANGA (O.). **Over ziekteverschijnselen van de Aardbei en over het voorkomen van een Actinomyceet in de weefsels van deze plant.** [On pathological symptoms of the Strawberry and on the presence of an Actinomycete in the tissues of this plant.]—*Meded. Landbouwhoogeschool te Wageningen*, xxxv, 5, 35 pp., 7 pl., 4 figs., 1931. [English summary.]

Strawberry plants on the experimental plots at Wageningen, Holland, showed symptoms corresponding to those described from England, the United States, and Canada under the names of 'small leaf', 'cauliflower disease', 'yellows', 'dwarf', and 'chlorosis' [*R.A.M.*, x, p. 42]. A regular feature of the abnormal condition was the occurrence of blister-like bubbles on the leaves, but attempts to transmit this symptom to healthy plants by means of filtered or unfiltered juice gave negative results. The tissues of diseased plants showed signs of phloem necrosis, brown cell walls with red margins in the phloem and vascular bundle sheath, a clouded yellow cell content of the affected tissues, and degeneration of the cell nuclei in the parenchyma surrounding the vascular bundles. Among the varieties affected by 'dwarf' (with blistering of the leaves) were Madame Montôt, Madame Lefèbre, Juliana, Leader, Barnes' Large White, Jucunda, Monarch, White Pineapple, and Deutsch Evern.

An acid-fast, Gram-positive Actinomycete was isolated from most of the petioles of affected plants examined and cultured on peptone-bouillon agar. The organism, which liquefies gelatine but does not decompose starch, consists of short rods (0·8 to 1 μ in length and about 0·5 μ in thickness) and hyphae measuring 1·3 to several hundred μ in length and 0·5 to 0·8 μ in thickness, the longer ones usually being branched. The larger, obtusely oval rods are often furnished with an extension of less sharply defined contours and somewhat more slender (0·4 μ) than the rod itself; these bodies are thought to be germinating spores.

Van Wisselingh's chitin test (*Jahrb. Wiss. Bot.*, xxxi, p. 619, 1897) proved very useful in the localization of the organism in the strawberry leaf tissues. The material for examination is heated for half-an-hour at 120° to 180°C. in potassium hydroxide to convert the chitin into chitosan, the presence of which is indicated by a reddish-purple to purple coloration on the application of 0·2 per cent. potassium iodide and some dilute sulphuric acid, after rinsing with alcohol and water. The rod-shaped organisms are readily detected in the stained preparations. It was found that all non-lignified cells of obviously diseased plants contain the Actinomycete, even apparently healthy leaves, the underground parts of the plant, the still folded shoots, and the seeds, whence it may pass into the seedlings.

The examination of apparently healthy strawberries revealed the presence of the same organism, and as the author failed to find any free from it, inoculation tests were not possible.

Some varieties of *Phaseolus*, the Duke of York potato, some

cucumber varieties, and the Ailsa Craig tomato (leaves and petioles) showed grains measuring 0·5 to 1·3 by 0·7 μ in the tissues. The chitin reaction was positive and culture experiments yielded an Actinomycete corresponding in morphological and physiological characters with that isolated from strawberries. The chitin test was further applied with positive results to the following: Golden Pippin apple, Beurré Hardy pear, Laxton's Prolific raspberry, Ogden's black currant, Mazagan broad bean [*Vicia faba*], White May turnip-top, French celery, Spanish round red pepper [*Capsicum annuum*], early Schietvrees Nunhem spinach, Nantes carrot, Lecerf cauliflower, and Egyptian red beet. The reaction given by red currant, Paragon III rhubarb, Primus Nunhem lettuce, Wonder of America peas, and yellow shallot [*Allium ascalonicum*] was very weak and purely local, while that of Yellow Zwijndrecht onion and some wild plants was negative.

WALKER (A. R.). **Strawberry root-rot studies.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 123–125, 1931.

In further investigations into strawberry root rot in Ontario [*R.A.M.*, ix, p. 433] 13·8 per cent. of the isolations made during winter and early spring gave a species of *Ramularia* and 58·6 per cent. a species of *Fusarium* [ibid., x, p. 254]. By the middle of June, however, the date when the disease had become common in the field during the last three seasons, *Ramularia* began to appear with considerable regularity and continued to outnumber the other organisms throughout the remainder of the season.

Inoculations of cuts made in individual strawberry roots under sterile conditions with the *Ramularia* resulted in the production of black root symptoms in each of 20 cases within four weeks, and the fungus was re-isolated from 18 of the successful infections. Similar inoculations with two strains of the *Fusarium* gave distinct blackening of the roots occasionally but not the typical peeling of the cortex. Inoculations made by immersing the roots in a suspension of *Ramularia* spores produced unmistakable black root symptoms in every case within four weeks, but those inoculated with the *Fusarium* showed no distinct symptoms of black root.

STRONG (F. C.) & STRONG (MIRIAM C.). **Investigations on the black root of Strawberries.**—*Phytopath.*, xxi, 11, pp. 1041–1060, 6 figs., 1931.

Black root of strawberries [*R.A.M.*, vii, p. 727] is stated to be widely distributed in the United States and is further reported to occur in Ontario, Canada. In Michigan, where the writers' studies were conducted, the reduction in stand may range from 5 to 60 per cent. Diseased plants are weakly and usually stunted. The roots are black, corky, and apparently dead, but in the earlier stages of the disease young white lateral roots may push out from the blackened cortical tissue. The affected cortex readily peels off, leaving the vascular cylinder white and apparently functioning. In younger plants the symptoms are more clearly defined. The leaves are smaller, and the main and lateral roots fewer, and either

completely rotted or marked with lesions which on the main roots are 0·5 to 5 cm. in length and usually encircle the root. At first they are reddish-brown and water soaked, later black, shrivelled, and sunken. During hot weather, the leaves of diseased plants wilt and become purplish or bronzed, the petioles turn red, the berries shrivel and hang green or semi-ripe on the stem, and the whole plant dies.

The infectious nature of the disease was determined by inoculation with strawberry débris, and fungus hyphae were constantly present in the lesions. The *Coniothyrium* stage of *Leptosphaeria coniothyrium* (*C. fuckelii*) [ibid., x, p. 117] and the *Hainesia* stage of *Pezizella lythri* (*H. lythri*) [ibid., x, p. 254] were frequently isolated from typically diseased roots and their pathogenicity proved on plants grown under controlled conditions. In several series of field inoculation tests [the results of which are summarized and tabulated] on runner plants rooted in clean or sterile sand, the typical symptoms were produced by each organism. Technical diagnoses of the two fungi are given in English.

Black root was not controlled by the treatment of the strawberry plants with standard fungicides before setting, and the elimination of infection would probably be best secured by suitable cultural measures, crop rotation, and the selection of resistant strains.

BERKELEY (G. H.). **Suspected Strawberry mosaic.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 125–126, 1931.

Attempts made over a period of three years artificially to produce the suspected strawberry mosaic in Ontario [*R.A.M.*, viii, p. 354] gave consistently negative results. Seed from diseased Van Dyke plants gave a percentage of affected plants, indicating that the condition is seed-borne. In the field the trouble was invariably confined to the variety affected and did not spread to others adjacent, and the fact that only the new varieties are attacked suggests that the trouble may possibly be genetical in origin.

SIMMONDS (J. H.) **Soft rot (water blister) of Pineapples.**—*Queensland Agric. Journ.*, xxxvi, 4, pp. 394–398, 1 pl., 1 fig., 1931.

This is a popular account of an investigation of the soft rot (water blister) of pineapples in Australia, caused by *Thielaviopsis* [*Ceratostomella*] *paradoxa*, which has already been noticed from another source [*R.A.M.*, xi, p. 192].

HOCKEY (J. F.). **Co-operative investigation of fungicides of Apple orchards.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 106, 1931.

The iron sulphate-lime-sulphur mixture [*R.A.M.*, x, p. 256] for the control of apple scab [*Venturia inaequalis*] came into commercial use in Nova Scotia in 1930. In the mixture now recommended the calcium arsenate is increased to 1½ lb. per 40 galls. water up to the fourth application, when the arsenate should be reduced to 3 lb. per 100 galls.

In 1930, comparative tests in Nova Scotia showed that the four spray calendars, Bordeaux mixture, lime-sulphur, aluminium sulphate-lime-sulphur [loc. cit.] and iron sulphate-lime-sulphur were equally efficient in the control of apple scab. Calcium arsenate was found to be essential fungicidally to both the aluminium sulphate and the iron sulphate mixtures, both of which reduced the burning caused by lime-sulphur. The iron sulphate mixture was a better carrier of calcium arsenate than was the aluminium sulphate mixture, and larger amounts of the arsenate could safely be used with it. While the aluminium sulphate mixture corroded the brass parts of the spray machine the iron sulphate mixture did not, no free hydrogen sulphide being generated. The spray residue in the iron sulphate mixture adhered so well that it is considered inadvisable to use this mixture after 1st July. Lead arsenate was not satisfactory with these two mixtures, either in adding to their fungicidal value or in preventing injury, and under the conditions prevailing in Nova Scotia smaller amounts of aluminium sulphate or iron sulphate than those recommended do not give satisfactory results. Neither mixture caused any degree of russeting at all comparable to that produced by Bordeaux mixture.

PITTMAN (H. A.). **Seed and seed-bed disinfection. Fundamental principles of plant disease control.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 3, pp. 394–403, 1 fig., 1931.

The main feature of this paper [which is meant to serve as a guide for practical growers] is a table showing the methods most commonly recommended for the disinfection of cereal, vegetable, and flower garden seeds. The paper also includes instructions for the preparation of mercuric chloride solutions and Cheshunt mixture, and brief recommendations for the disinfection of the soil in seed-beds by steam or fire, and by means of formalin.

MARTIN (H.) & SALMON (E. S.). **The fungicidal properties of certain spray-fluids. VIII. The fungicidal properties of mineral, tar and vegetable oils.**—*Journ. Agric. Sci.*, xxi, 4, pp. 638–658, 1931.

Continuing their study of the fungicidal properties of certain spray-fluids, as measured by their action on the conidial stage of *Sphaerotheca humuli* on the hop [*R.A.M.*, ix, p. 797], the authors give an account of tests in 1930 of a wide range of mineral, tar, and vegetable oils. When emulsified with 0·5 per cent. soft soap the following substances gave effective control of the fungus, without injury to the foliage of the host, namely, 2·5 to 3 per cent. summer solol (a proprietary preparation containing 61·6 per cent. by weight of high-boiling petroleum oils), 0·25 to 0·5 per cent. cottonseed oil (in one exceptional case this failed, however, to kill all the mildew patches at 1 per cent.), 0·25 to 0·5 per cent. sesame oil, 2 per cent. rape oil, 0·5 per cent. olive oil, 0·5 to 1 per cent. peach-kernel oil, and 2 to 4 per cent. castor oil. Adequate control was also afforded by 2 per cent. liquid paraffin and 2·5 per cent. volck (a proprietary preparation containing 80 per cent. by weight

of mineral oils) [ibid., ix, pp. 466, 790], when emulsified with soft soap, but these fluids are apt to cause injury to the leaves under certain conditions. Sternol insecticide (which contains 75·3 per cent. high-boiling petroleum oils) was almost fungicidal at 2·5 per cent. with 0·5 per cent. soft soap. All the tar oils tested were either non-fungicidal or injurious to the hop leaves.

WINKELMANN (A.). **Prüfung des Schwefelvernebelungsapparates 'Sulfurator'.** [Testing of the sulphur fumigation apparatus 'Sulfurator'.]—*Obst- und Gemüsebau*, lxxvii, 11, pp. 180–181, 3 figs., 1931.

Particulars are given of the construction and application of the Sulfurator sulphur fumigation apparatus (Rota-Werke, Aachen) which is intended to replace the Rota Generator, more especially for outdoor work [*R.A.M.*, viii, p. 548]. The apparatus consists of an oven with several openings and a lid closing by means of wedges, a container for the sulphur, and a bellows (hand or foot, as desired). After charcoal has been made red-hot in the oven, the sulphur is heated to a temperature of 450° C. and air slowly blown through with the bellows. The heated sulphur issues from the apparatus in a thick, yellow cloud, for the dispersal of which a period of 8 to 10 minutes is required, a similar time being necessary for the above-mentioned preliminaries. With 250 gm. sulphur a greenhouse of about 100 cu.m. can be treated. The sulphur is finely and uniformly dispersed and cannot be washed from the window-panes with a powerful hose. The small apparatus weighs about 9 kg., while the larger one, specially constructed for outdoor use, weighs some 40 kg. and holds 6 kg. sulphur which can be dispersed continuously at the rate of 10 kg. per hour. The larger machine is furnished with a movable chimney, so that the sulphur clouds can be turned in any direction. No technical defects were found in either apparatus in trials conducted at the Biologische Reichsanstalt. The cost of the small sulfurator is M. 63 and of the large one M. 320.

ARAGÃO (H. de B.). **Pesquizas sobre Phytomonas françai.** [Researches on *Phytomonas françai.*]—*Mem. Inst. Oswaldo Cruz*, xxv, 4, pp. 299–302, 2 pl., 1931. [German translation, pp. 303–306.]

The transmission of the flagellate *Phytomonas françai* [the genus name *Phytomonas* is sometimes used for the plant inhabiting flagellates referred to *Leptomonas* by other workers: cf. *R.A.M.*, i, p. 309] was effected by grafting cuttings of *Manihot palmata* containing the organism in the latex on to healthy ones, the incubation period being about ten days. The flagellate was also transferred from *M. palmata* to cassava (*M. utilissima*) by the same means. No difference was detected between infected and healthy plants, showing that in Brazil *P. françai* is innocuous to its hosts. So far no insect has been found to be implicated in the transmission of infection from plant to plant.

After considerable difficulty a small number of pure cultures of the flagellate were obtained on a modified Nöller's medium, in which human blood was substituted for that of rabbits. However,

as with other species of *Phytomonas*, the cultures remained viable only for two to three months, and further investigations concerning the optimum cultural requirements of the organism are indicated [cf. above, p. 237]. The dimensions of *P. français* in culture are 10 to 25 by 2 to 3 μ (body only), the length of the flagellum being 5 to 8 μ.

ALCOCK (Mrs. N. L.). **Notes on common diseases sometimes seed-borne.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 4, pp. 332–337, 1931.

This tentative list includes brief notes on the more common seed-borne diseases of a small range of vegetable and forage crops, and a few ornamental plants.

SATHE (T. R.) & SUBRAHMANYAN (V.). **The relation between seeds and micro-organisms.**—*Journ. Indian Inst. Sci.*, xiv A, 8, pp. 119–139, 1931.

A full discussion, supplemented by tables, is given of the writers' experiments at the Indian Institute of Science, Bangalore, to ascertain (*a*) whether specific micro-organisms occur in definite physiological association with seeds, and (*b*) whether such organisms, either individually or as a whole, exert any direct or indirect influence on seed germination and seedling development.

It is concluded that in the few cases in which the seed bore organisms the latter were fortuitous and without physiological significance. No harmful effect on germination or subsequent growth was detected.

NAOUMOFF (N. A.). Болезни овощных и садовых растений (с основами общей фитопатологии). [Diseases of vegetable garden and orchard plants (together with the elements of general phytopathology).]—382 pp., 151 figs., 11 maps, 5 graphs, Гос. Издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1931.

In a preface to this book the author states that it is the outcome of many years of his pedagogic activity and is designed both for beginners and the more advanced student in phytopathology. For this reason, the work does not aim at giving an exhaustive list of the diseases of vegetable crops and orchard trees occurring in Russia, but those that are considered are dealt with in full detail in regard to their symptoms, and to the morphology and biology of the causal organisms and their relationship to the host. In the physiological diseases discussed, the causes from which they arise are treated at some length. A considerable portion of the book is devoted to theoretical and practical considerations of the problem of plant disease control, including the estimation of the damage done to the crops. Almost all the figures illustrating this work are original and well executed though poorly reproduced. The extensive and useful bibliography appended occupies 29 pages.

KLEBAHN (H.). **Fortsetzung der experimentellen Untersuchungen über Alloiophyllie und Viruskrankheiten.** [Continuation of the experimental investigations on alloiophylly and virus diseases.]—*Phytopath. Zeitschr.*, iv, 1, pp. 1–36, 2 figs., 2 diags., 1931.

Continuing his investigations on alloiophylly of anemones and other virus diseases [*R.A.M.*, vii, p. 797], the writer first conducted a series of tests to determine the nature of tobacco mosaic. The idea that the virus might be an enzymatic substance led to experiments [the technique of which is described] in its treatment with glycerine and alcohol, which showed that it resists the action of these substances for several days, conserving its virulence in a precipitated and air-dry condition for at least a month. The experiments are thought to suggest that the virus is non-living, but the objections to this view are set out.

Filtration experiments yielded the following tentative conclusions. Since an albumin-proof filter apparently retained the greater part of the virus, the virus particles must be larger than the albumin molecules used in the tests. Secondly, as the filtrate from a Congo red-proof filter caused a fair number of infections, the virus particles are presumably smaller than the Congo red molecules (about 40 $\mu\mu$), an observation agreeing reasonably well with Duggar's estimate for the tobacco mosaic particles of 30 to 35 $\mu\mu$ [ibid., ii, p. 133].

The tobacco mosaic virus was found to withstand heating up to 100° C., followed by immediate cooling, and also retained its virulence after ten minutes in water at 90°, gradually dropping to 70°. It further tolerated one second at boiling-point, but was destroyed by two to three seconds' exposure to this temperature. These observations are considered to indicate the 'non-vegetative' character of the tobacco mosaic virus.

Mosaic symptoms failed to develop on *Nicotiana glauca* as a result of inoculation with the tobacco mosaic virus, but in one instance the inoculation of tobacco with virus recovered from *N. glauca* proved successful.

Experiments were also conducted to ascertain whether the various types of potato mosaic are transmissible by ultra-filtered virus. Inoculations with aucuba mosaic failed. Crinkle was successfully transmitted, though the inoculated plants sometimes showed only mosaic. Ordinary mosaic and interveinal mosaic were also transmitted, but the latter gave either ordinary mosaic or crinkle in the infected progeny.

Grafting experiments were carried out in connexion with a study of *Abutilon* chlorosis [ibid., vii, p. 797 ; viii. p. 662]. *A. striatum* grafted on *A. thompsoni* and reciprocally became markedly chlorotic. Variegation also developed in *A. thompsoni* grafted on *A. darwinii*, in *A. venosum* on *A. thompsoni* and reciprocally, in *A. thompsoni* on *A. megapotanicum*, in *A. sellovianum* on *A. thompsoni* and reciprocally, and in *A.* 'Andenken on Max Hellwag' on *A. thompsoni*. The following double grafts were made. *A. thompsoni* was grafted on *A. striatum*, followed by *A. sellovianum* on the former ; *A. striatum* became quite variegated, but later this variety and *A. thompsoni* lost their mottling, whereas

this feature developed to a marked extent in *A. sellovianum*. *A. thompsoni* was grafted on *A. venosum*, followed by *A.* 'Goldenes Vliess', in which case *A. venosum* developed mottling but not the second graft. Chlorosis was further induced in *A. striatum* and *A. sellovianum* plants by intermittent contact with *A. thompsoni*. the cut surfaces of the stems being clamped together for six or seven days, released, the wounds shaved to expose new cells, and the stems rejoined; this process was repeated five or six times.

The results [which are fully described] of inoculation experiments on anemones with ground rhizomes and leaves, as well as with ultra-filtered expressed sap of diseased plants led to the tentative conclusion that the agent of alloiophylly resides in the soil or in the decaying remnants of infected plants on the surface of the ground. No evidence of insect transmission of the infective principle was obtained.

Olitsky (P. K.) & Forsbeck (F. C.). **Concerning an increase in the potency of mosaic in vitro.**—*Science*, N.S., lxxiv, 1924, pp. 483–484, 1931.

Previous experiments by the first-named author indicated that multiplication of the tomato and tobacco mosaic viruses had occurred in the absence of living cells [*R.A.M.*, iv, p. 300]. These results, however, were not confirmed by the work of J. H. Smith and others [cf. ibid., vii, p. 749], and a fresh investigation was therefore conducted.

About 3,000 tomato plants, with several thousand controls, were used in a series of 30 tests, in six of which the original technique was followed as closely as possible, while in the remainder considerable modifications were made. The hydrogen-ion concentration of the media was kept constant by diluting one part of filtered fresh normal plant juice with 2·5 parts of Northrop's buffer (*Journ. Gen. Physiol.*, iv, p. 639, 1922) at P_H 5·3, the tests being made under aerobic or anaerobic conditions in the dark or sunlight. Fifteen experiments were carried out with Gates's U tubes (*Journ. Exper. Med.*, xxxv, p. 635, 1922). A collodion sac containing fresh, lightly crushed, young plants in buffer solution was inserted in one arm of the tube and buffer solution containing filtered virus was placed outside the sac, the medium within the latter being replaced one to seven times weekly. The tubes were kept at 28° C.

In nearly every case, irrespective of the method employed, there was some increase in the potency of the virus beyond the original titration, as was also observed by McKinney [ibid., viii, p. 189]. In the early experiments this increase was much greater than in the later ones, possibly on account of some cyclic variation in the virus. The question arises whether the increase was due to an activation or a dispersion of aggregated virus particles by some unknown mechanism, or whether it represented actual multiplication of a living agent. The latter interpretation cannot be definitely accepted on the basis of the present data.

BLATTNÝ [C.]. **Virové choroby.** [Virus diseases.]—*Ochrana Rostlin*, xi, 3–4, p. 138, 1931.

The author states that the year 1931 was marked by severe outbreaks of certain virus diseases of cultivated plants, which in former years were either rare or even unknown in Czecho-Slovakia. In one locality spinach suffered very heavily from yellows differing from the usual form in the severe deformation of the leaves which accompanied the characteristic discoloration. The disease is carried by the aphid *Aphis rumicis* [*R.A.M.*, ix, p. 428]. Cucumber mosaic, which for many years had not been reported, was severe in one commercial market garden. Mosaic of plum trees attained considerable economic importance, both in nurseries and orchards, but local varieties appeared to be much more resistant to it than imported varieties. Observations in nurseries showed that the disease is transmitted by pruning tools.

PHILLIPS (J.). **The root nodules of Podocarpus.**—*S. African Journ. of Sci.*, xxviii, p. 252, 1931.

Material from four South African species of *Podocarpus* examined microscopically, and from two examined in culture by the author, showed the presence of *Pseudomonas* [*Bacillus* | *radicicola* [*R.A.M.*, x, p. 398] Fungal mycelium was confined to the outer cortical tissues of nodules over a season old. Seedlings of *Podocarpus latifolius* and *P. falcatus* grown in sterilized soil without nodules were feeble and succumbed early, while those in non-sterilized soil with nodules developed normally. The watering of seedlings in sterilized soil with a bacterial infusion enabled the plants to form nodules and make vigorous growth. In the material examined, therefore, *B. radicicola* was evidently of greater importance in the growth of *Podocarpus* than the mycorrhizal fungus.

TUCKER (J.). **Potato inspection and certification service.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 161–166, 1931.

In 1930, 9,707 fields comprising 34,305 acres were inspected for potato certification in Canada [cf. *R.A.M.*, x, p. 745], representing an increase of 2,275 acres over the figure for 1929. Approximately 81 per cent. of the total acreage inspected passed the two field inspections required for certification, the best record in this respect that has yet been attained in Canada. Altogether 2,411 fields or 24·82 per cent. of the total number of fields inspected were rejected. Mosaic was responsible for the rejection of 1,278 fields, or 53 per cent., and blackleg [*Bacillus phytophthorus*] for 227 fields; the latter is a slight increase over the previous year's figures.

LEACH (J. C.). **Blackleg disease of Potatoes in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 76, 36 pp., 15 figs., 1 map, 1931.

A full account is given of the blackleg disease of potatoes in Minnesota which is stated to cause an average annual loss of 2 per cent. of the crop, while in some fields the losses may amount to 50 per cent. or more. Heavy damage may also be sustained from this cause by potatoes stored under suitable conditions.

The author regards the causal organism of this disease [*Bacillus phytophthorus*] as identical with *Erwinia carotovora* [*Bacillus carotovorus*] and from a comparative study of allied organisms now adds *B. oleraceae* Harrison, *B. omnivorus* van Hall, and *B. apiovorus* [*R.A.M.*, iii, p. 263] to the list of synonyms of this species previously reported [ibid., x, p. 125].

There are at least three distinct sources of infection, viz., systemic infection of seed tubers, direct infection of the seed pieces by bacteria from the soil, and infection following the attack of seed pieces by the seed corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) [ibid., x, p. 619]. The action of the bacteria on the potato tissues is essentially the same as that of the soft rot of other plants. The control of the disease is somewhat complicated, being dependent on a number of variable factors, but the losses may be reduced to a minimum by certain cultural practices, including the use of certified seed, disinfection of seed tubers, the planting of seed pieces as soon as possible after cutting them, and crop rotation.

MacLeod (D. J.) & Hurst (R. R.). **Testing effect of new chemical substances on the control of tuber diseases.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 155–156, 1931.

In further tests conducted during 1930 in Prince Edward Island on the control of potato scab [*Actinomyces scabies*] by various seed treatments [*R.A.M.*, ix, p. 435], the best control (under 5 per cent. severe infection) was given by Du Bay 738 and 664, sanoseed, hot mercuric chloride, hot formaldehyde, Du Bay 694 and Cal K. The results in general confirmed those of previous seasons, further demonstrating that seed treatment can be depended upon only as giving partial control of *A. scabies* or *Rhizoctonia* [*Corticium solani*], effective control of which necessitates combining seed treatment with cultural practices designed to correct soil and other conditions which predispose to these diseases [ibid., x, p. 748].

Hurst (R. R.). **Date of digging Potatoes in relation to degree of infection with Rhizoctonia.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 150–153, 1931.

In a test made on Prince Edward Island in 1930 to ascertain the effect of the date of digging upon infection of Green Mountain and Irish Cobbler potatoes by *Rhizoctonia* [*Corticium solani*] it was ascertained that when dug on 1st September neither variety became affected, but infection increased with each subsequent date of digging after about the middle of September. Digging on 8th September resulted in the Green Mountain tubers showing no disease and the Irish Cobbler tubers only 1 per cent. infection; by 15th September the corresponding figures for the two varieties were 3 and 7 per cent. respectively, and by 13th October they were 41 and 75 per cent. Infection was abundant although the weather was warm and dry.

The beneficial effects of early digging are important to growers of potatoes for seed certification. The saving effected in time and labour together with the higher percentage of clean seed obtained

compensated for any loss entailed through mechanical injuries and reduced yield.

CHAMBERLAIN (E. E.). **Corticium disease of Potatoes. II. Induced dormancy and tuber-injury resulting from seed treatment.**—*New Zealand Journ. of Agric.*, xliii, 5, pp. 350–356, 1 fig., 1 graph, 1631.

Continuing his investigations of the *Corticium* [*solani*] disease of potatoes in New Zealand [*R.A.M.*, xi, p. 201], the author gives details of experiments to ascertain the effect on the viability of seed tubers of their treatment by the acidulated corrosive sublimate method recommended for general use in the Dominion, and consisting in dipping the tubers for 90 minutes in a solution of 1 part mercuric chloride, 6·6 parts concentrated hydrochloric acid in 1,000 parts water [cf. ibid., vi, p. 115; x, pp. 203, 268]. The results of the tests (in which varying concentrations of the solution were used) showed that 75 minutes in the solution recommended did not cause pitting of the tubers (Epicure variety), but after 90 minutes there was slight pitting. The severity of the pitting, varying from slight depressions of the tuber surface at the lenticels or any wounds to destruction and discoloration of the tissue in the vicinity of the pits, increased with the concentration of the solution. Germination tests showed that where severe pitting had resulted, the treatment had brought about an induced dormancy of the 'eyes' and had also killed off all the 'eyes' of some of the tubers. There was evidence that seed-size tubers were more severely affected by the treatment than larger sized tubers which were cut before planting, and that various potato varieties react differently to the treatment [cf. ibid., viii, p. 332], Majestic being among the most susceptible, and Herald, Up-to-date, and Epicure very resistant.

Further tests to determine the most suitable time to treat the seed tubers showed that, in order to avoid damage, the treatment should be carried out ten weeks before planting, but if delayed it should then be given immediately prior to sowing, as this tends to minimize the injury. During the past three years large quantities of seed potatoes were treated by this method at the Ashburton Experimental Farm about four months before planting, and although a certain amount of pitting occasionally occurred, in no case did the treatment affect either the germination or the growth of the plants.

BRETHENOUX. **Le Rhizoctone de la Pomme de terre.** [Potato *Rhizoctonia*].—*Journ. d'Agric. Prat.*, N.S., xcv, 45, pp. 369–370, 1 fig., 1931.

A brief, popular account is given of the *Rhizoctonia* disease of potatoes [*Corticium solani*], which is stated to have occurred on a large scale in France during the current season. Growers are particularly recommended to disinfect seed procured from Holland with 500 gm. formol per 100 l. water, the use of the more efficacious corrosive sublimate being prohibited in France [cf. *R.A.M.*, ix, p. 234]. A period of four years should elapse before potatoes are replanted in soil that has once been infested by the fungus. Other preventive measures are briefly indicated.

Köhler (E.). **Zur Biologie und Cytologie von Synchytrium endobioticum (Schilb.) Perc.** [On the biology and cytology of *Synchytrium endobioticum* (Schilb.) Perc.]—*Phytopath. Zeitschr.*, iv, 1, pp. 43–55, 17 figs., 1931.

A detailed account is given of the author's biological and cytological studies on the causal organism of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xi, p. 69], comprising zygote formation, penetration of gametes and zygotes into the host tissues, nuclear relations of gametes and zygotes, and development of the fungus in the host cell.

Říha (J.). **O významu zkoušky klíčivosti pro zjišťování zdravotního stavu hliz Bramborových.** [The significance of sprouting tests in the establishment of the health of Potato tubers.]—*Ochrana Rostlin*, xi, 3–4, pp. 103–114, 2 figs., 1931. [German summary.]

Some details are given of observations and experiments in 1923–24 and 1929–30 at the Agricultural Experiment Station of Valecov, Czecho-Slovakia, for the purpose of determining whether the presence in potato seed tubers of outwardly unrecognizable diseases, and more particularly of virus diseases, could be detected by means of tuber sprouting tests. The results showed that mosaic-diseased tubers sprout somewhat earlier than normal, and their sprouts grow a little faster than those of healthy plants. Leaf roll and healthy tubers begin to sprout almost simultaneously, but the sprouts of the former develop somewhat more slowly than those of the latter. Tubers from hills infected with blackleg [*Bacillus phytophthorus*] start sprouting somewhat later than healthy ones, and the sprouts develop more slowly. The general indications are, however, that these differences are too small to serve for diagnostic purposes, the more so as considerable variations also occur in the start and further development of the sprouts in individual tubers of even the same potato variety.

Costantin (J.), Lebard (P.), & Magrou (J.). **Influence du séjour en montagne sur la productivité de la Pomme de terre.** [Influence of a period of growth in the mountains on the productivity of the Potato.]—*Comptes rendus Acad. des Sciences*, cxciii, 20, pp. 902–906, 1 fig., 1931.

Brief details are given of a small range of experiments in which part of the tubers from the same hills of healthy (Triumph and Imperia) and leaf roll (Belle de Juillet, Royal Kidney, and an unnamed variety collected at an altitude of 1,280 m.) potato varieties were grown in 1930 in the plain, and the other part at an altitude of 1,650 m., and the progeny of both lots was then tested in 1931 for yield in the vicinity of Paris [*R.A.M.*, x, p. 266]. The results showed that on fertile, manured, and well cultivated soil, the progeny of the healthy varieties kept for one year in the mountains was conspicuously more vigorous, matured 4 or 5 days earlier, and had a markedly heavier yield (by 27·3 per cent. for Triumph and 61·1 per cent. for Imperia), than that of the plants kept in the plain. This effect was much less pronounced on sandy, non-fertilized, and

poorly cultivated soil, and there was some indication that it may not be maintained the second year of cultivation in the plain. The cultivation for one year in the mountains did not appear to be of any great significance in the case of the leaf roll varieties, the yield of which was but slightly increased on the poorer soil.

CHIAPPELLI (R.). **Il brusone e l'equilibrio della concimazioni.** ['Brusone' and the balance of fertilizers.]—*Giorn. di Risicolt.*, xxi, 11, pp. 173–176, 1 fig., 1931.

The writer has found that the addition of potassium chloride to a fertilizer consisting of farmyard manure, superphosphate, and ammonium sulphate not only prevents the development of the 'brusone' disease of rice [*R.A.M.*, xi, p. 202], but cures mild cases. In one test the yield was augmented from 3·17 to 4·36 quintals per 950 sq. m. (equivalent to an increase of 45·90 over 33·35 quintals per hect.) by the use of this substance. A similar action was exerted by ferrous sulphate.

CRAIGIE (J. H.). **An experimental investigation of sex in the rust fungi.**—*Phytopath.*, xxi, 11, pp. 1001–1040, 14 figs., 1931.

A comprehensive account is given of the author's studies on the sexual behaviour of two rusts, *Puccinia graminis* and *P. helianthi* [*R.A.M.*, x, p. 365].

Details are given of an apparatus by which single sporidia can be picked off their sterigmata, and two methods of inoculation are described enabling both mono- and bisporidial pustules to be obtained.

Pycnidia developed on the upper side of each pustule of *P. graminis* and *P. helianthi*. Both rusts are heterothallic, the monosporidial pustules being of two sexes (+) and (−), which occur in approximately equal numbers indicating a differentiation of the sexes in the sporidia.

A large majority of the monosporidial pustules of *P. graminis* and *P. helianthi* failed to produce aecidia [cf. ibid., x, p. 784], those that did so being possibly due to the accidental mixture of their nectar by handling or through the agency of insects. About half the compound or bisporidial pustules of both rusts produced aecidia.

The intermixture of the nectar of monosporidial pustules of *P. graminis* or *P. helianthi* induces aecidial formation in the pustules thus treated in five to six days. Flies are active agents in carrying the nectar with pycnospores from one pustule to another. Nectar of a (+) pustule applied to the pycnidia in one part of a (−) pustule induces aecidial formation in the region to which it is applied, but rarely beyond. From one of the aecidial cultures of *P. graminis* a new physiologic form was isolated and designated as No. 57 by Stakman and Levine [ibid., x, p. 15].

Some evidence of heterothallism was also obtained in *P. coronata* [*P. lolii*], *P. pringsheimiana*, and a species of *Gymnosporangium* (? *G. corniculans*) on *Amelanchier alnifolia*.

Two methods are described whereby a cross may be made

between two physiologic forms of a heterothallic rust producing pycnidia and aecidia.

A bibliography of 90 titles is appended.

CUNNINGHAM (G. H.). **The rust fungi of New Zealand together with the biology, cytology and therapeutics of the Uredinales.**—xx + 261 pp., 3 pl., 175 figs., Dunedin, N.Z., J. McIndoe, 1931.

This very useful and handy volume is the outcome of many years' continuous study of the rust fungi [*R.A.M.*, x, p. 343]. The first part of the work comprises a condensed survey of present knowledge of the biology of the rusts, while the second covers the taxonomy of all species known to occur in New Zealand. The following are the main headings under which the subject is discussed: morphology and cytology of spore forms; germination and viability of the spores; entry and penetration of the host; dissemination and perpetuation of the rusts; parasitism; biologic and physiologic specialization; therapeutics; evolution of families and genera; technique; classification of the Uredinales; and systematic position of New Zealand rusts. Most of the figures are original. A bibliography of 21 pages is appended.

WAKSMAN (S. A.) & DIEHM (R. A.). **On the decomposition of hemicelluloses by microörganisms. I. Nature, occurrence, preparation, and decomposition of hemicelluloses. II. Decomposition of hemicelluloses by fungi and Actinomyces. III. Decomposition of various hemicelluloses by aerobic and anaerobic bacteria.**—*Soil Sci.*, xxxii, 2, pp. 73–139, 7 graphs, 1931.

A detailed and fully tabulated account is given of the writers' investigations in New Jersey on the mode of decomposition of the hemicelluloses in plant tissues by soil micro-organisms [cf. *R.A.M.*, xi, p. 3].

All the fungi tested, including *Actinomyces* spp., *Zygorrhynchus* sp., *Rhizopus* sp., *Penicillium* sp., *Trichoderma* sp., *Humicola* sp., *Cunninghamella* sp., *Aspergillus niger*, and *A. fumigatus*, proved capable of decomposing mannan, xylan, and galactan, the last-named substance being the most resistant. The actinomycetes were particularly active in the process of disintegration under favourable cultural conditions. Both fungi and actinomycetes liberate considerable quantities of carbon dioxide in the course of destruction of the hemicelluloses, while the former also produce small amounts of organic acids.

Generally speaking, the micro-organisms decomposing the hemicelluloses are less specific than those attacking the celluloses, the xylans, pentosans, and mannans being liable to destruction by a great variety of common soil flora. No attempt, therefore, has been made to describe new types of organisms responsible for the decomposition of these carbohydrates, a procedure that would involve the isolation and study of hundreds of species. The micro-organisms causing hemicellulose decomposition require available sources of nitrogen for the synthesis of their microbial

cell substance, just as cellulose-decomposing bacteria do [ibid., v, p. 763].

Le Clerg (E. L.). **Distribution of certain fungi in Colorado soils.**—*Phytopath.*, xxi, 11, pp. 1073–1081, 1931.

The results [which are discussed and tabulated] of an examination of 13 different types of Colorado soils [*R.A.M.*, vii, p. 740] showed that *Fusarium* spp. are more widely distributed and occur with greater frequency than any other fungi, constituting 23 per cent. of the total flora found in all the 226 samples investigated. *Penicillium humicola* came next in order and *Trichoderma lignorum* third. Species of *Aspergillus* and *Penicillium*, especially *P. expansum* and *P. digitatum*, were also extensively encountered in beet soils. *Sepedonium chrysospermum* was found exclusively in sugar beet soils; this organism has only twice before been reported from the soil, once in England (*Ann. Myc.*, xii, p. 32, 1914) and once in New Jersey (*Soil Sci.*, iii, p. 565, 1917).

Species of *Fusarium* were found in all the samples of gladiolus soil examined, and comprised 30 per cent. of the entire fungal flora. The fields in question had produced plants showing marked symptoms of root rot due to *F.* sp. the previous year [cf. ibid., ix, p. 700]. *T. lignorum* and *P. citrinum* were also prevalent in these soils.

Maize soils contained a larger variety of fungi than any of the other soils investigated, 21 species being isolated.

P. expansum and *F.* spp. were isolated from each of the 30 samples of potato soil examined, the former constituting 54 and the latter 25 per cent. of the total flora.

Nineteen species of fungi (including seven of *Penicillium*) were isolated from 15 samples of winter wheat-growing soils. *F.* spp. were found in all the samples and formed 23 per cent. of the total flora.

F. spp. were very prevalent in the 19 samples of alkali soils, comprising 24 per cent. of the total flora, while *P. expansum* formed 44 per cent. These organisms were also the most abundant at a soil depth of 6 to 12 in. At a depth of 3 ft. below the surface *F.* spp., *P. expansum*, *Absidia spinosa*, and *Alternaria* spp. were found, and at 6 ft. *F.* spp. and *Absidia spinosa*.

Dodds (H. H.). **The work of the Natal Sugar Experiment Station.**—*South African Sugar Journ.*, xv, 11, pp. 705, 707, 709, 711, 1931.

The sugar-cane varieties P.O.J. 2714, 2725, 2727 are proving valuable in Natal, while among the 18 selections from the Indian Government Cane Breeding Station, Coimbatore, now undergoing trial at Mount Edgecombe, Co. 290 shows special promise in respect of resistance to disease and other desirable characters. Owing to the risk of introducing destructive diseases and pests on sugar-cane cuttings, these may be imported into South Africa only by the Sugar Association. After fumigation the plants are grown for a year or longer in an insect-proof quarantine greenhouse at Durban.

ORIAN (G.). **Les galles des tiges de la Canne à Sucre à Maurice.** [Stem galls of Sugar-Cane in Mauritius.]—*Rev. Agric. de l'Île Maurice, 1931*, 58, pp. 131–133, 1931.

In 1926, the author observed for the first time in Mauritius several instances of a peculiar condition of sugar-cane known as 'bunch-top' in Hawaii [*R.A.M.*, ix, p. 341] and considered by Lyon as analogous to the disease termed 'stem galls' (*Hawaiian Planters' Rec.*, xxx, 4, pp. 492–506, 1926). In 1930, numerous minute galls were noted on some of the youngest internodes of a stem of R.P. 6 cane and in February, 1931, specimens of P.O.J. 2878, a variety recently introduced into Mauritius, were received showing protuberances on the stems definitely recognized as galls. They consisted in irregularly and variously shaped excrescences on the stem near the node or on the internode. Occasionally they were found on the entire circumference and were sometimes rather large, in which case they often formed numerous adventitious buds which gave rise to a more or less compact bunch of shoots, with a witches' broom appearance. Apart from the galls, the stems appeared quite healthy.

As the cause of the condition has not yet been ascertained, growers are recommended to deal with bunch-top as if it were infectious.

TIMS (E. C.) & EDGERTON (C. W.). **Behavior of mosaic in certain Sugar-cane varieties in Louisiana.**—*Amer. Journ. of Botany*, xviii, 8, pp. 649–657, 1931.

The writers discuss and tabulate the results of their studies in Louisiana on the varying degrees of resistance to mosaic shown by different sugar-cane varieties. In old varieties, such as D. 74 and Louisiana Purple, which show little or no tendency to recover from the disease [*R.A.M.*, x, p. 689], strains have gradually been selected that show the mosaic symptoms only in the mildest form. Of the four P.O.J. varieties used in the investigations, P.O.J. 36 and 234 were found to be quite susceptible, while P.O.J. 213 and 228 may be classed as resistant. The relative resistance of these varieties is regarded as largely due to the capacity of the plants to throw off the disease and produce buds free of the virus. The comparatively resistant P.O.J. 213 and 228 produce a much greater number of healthy shoots from infected stalks than do the more susceptible P.O.J. 36 and 234, while the disappearance of the mosaic symptoms during the summer months in the field is also more common in the two former varieties.

BRANDES (E. W.). **Breeding for resistance to mosaic.**—*Facts about Sugar*, xxvi, 11, pp. 490–491, 493, 3 figs., 1931.

Among the accessions of the Papua expedition of the United States Department of Agriculture in 1928 [*R.A.M.*, viii, p. 133; x, p. 643] are a number of varieties of the new sugar-cane species provisionally named *Saccharum robustum* Jeswiet, a marked characteristic of which appears, from field observations, to be freedom from mosaic coupled with vigorous growth. The disease was found to occur in Papua in several varieties of *S. officinarum* [ibid., viii, p. 132] and was also fairly common in *Coix lachryma-jobi*.

Recent controlled breeding experiments have indicated that the natural hybrid Kassoer is probably a cross between *S. spontaneum* and the Zwart Cheribon (Louisiana Purple) variety of *S. officinarum*. Some of the Papuan varieties give evidence of being natural hybrids of *S. robustum* × *S. officinarum*. The largest variety of the Papuan wild cane group, viz., 28 NG. 251, readily contracted mosaic when exposed to natural infection in Porto Rico. Resistance to mosaic appears to be governed by multiple factors. In the cross *S. barberi* (Chunnee) × *S. officinarum* (Cheribon), both of which are susceptible to mosaic and not specially tolerant, the F_1 generation produced numerous individuals like P.O.J. 213, quite acceptable from a commercial standpoint in respect of mosaic tolerance.

The cross *S. spontaneum* (immune) × *S. officinarum* (susceptible) has, in the writer's experience, always yielded apparently immune seedlings in the F_1 and a high proportion of similar material in the F_2. In the latter generation exposed to natural infection in Louisiana in 1922, 9 out of 650 seedlings contracted mosaic, while only 2 out of 70 became diseased under similar conditions in 1924. Susceptibility to mosaic would appear from these data to be recessive in this particular cross, though the occurrence of the disease in Co. 205, an F_1 hybrid of *S. spontaneum* × *S. officinarum*, has been reported in India [ibid., ix, p. 430] and Florida. On the basis of present knowledge it would appear that the most rapid improvement of the sugar-cane will be effected by further back-crossing on the already available hybrids of *S. spontaneum* × *S. officinarum*. Commercial resistance, combined with high cane weight and sucrose content, is found in many of the resulting seedlings, as well as in some of those derived from crosses in which both parents are susceptible.

ROLDAN (E. F.). **The non-infectious twisted or tangled top disease and pokkah-boeng of Sugar Cane in the Philippine Islands.**—*Sugar News*, xii, 10, pp. 726–728, 1931.

Careful microscopic and cultural investigations having failed to reveal the presence of an organism in P.O.J. 2878 sugar-cane plants from Laguna affected by twisted or tangled top [*R.A.M.*, ix, p. 341], this disease is attributed to physiological causes. Observations have shown that the twisting and chlorosis are prevalent on rapidly growing canes about three months old during severe drought in April and May.

Another form of tangled top disease, the so-called pokkah-boeng, also occurring on P.O.J. 2878 in Laguna and Pampanga, has been found to be due to a species of *Fusarium* differing from *F. moniliforme* [*Gibberella moniliformis*] in the capitate arrangement of its conidia and resembling that described by Tucker from Porto Rico [ibid., ix, p. 291]. Inoculation experiments with mycelial and spore suspensions of this organism were carried out on the leaf spindles and growing points of the plants and resulted in complete twisting and tangling of the leaves with the former method and rotting of the top with the latter. The symptoms could not be induced, however, by pouring suspensions of the fungus on the

tops of healthy plants, a fact denoting that the species in question is only weakly parasitic.

VERWOERD (L.). **A preliminary list of fungi from the Bloemfontein district of the Orange Free State.**—*S. African Journ. of Sci.*, xxviii, pp. 298–301, 1931.

A list is given of 152 species of fungi belonging to 83 genera occurring in the Bloemfontein district of the Orange Free State, which is stated not to have been previously explored from the mycological standpoint.

DIPPENAAR (B. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa—II.**—*S. African Journ. of Sci.*, xxviii, pp. 284–289, 1931.

Phoma zantedeschiae n. sp. is characterized by black, subepidermal, globose pycnidia, 90 to 160 μ in diameter (or depressed, 90 to 144 by 150 to 244 μ) and hyaline, oval or elliptical, unicellular pycnospores, 3 to 3·5 by 6 to 8 μ; it forms elongated, sunken, dark brown spots with greyish centres on the flower stalks and green parts of the spathe of *Zantedeschia aethiopica.*

Phyllosticta brassicae [*Phoma lingam*: *R.A.M.*, vii, p. 71] was observed forming discoloured spots with a bluish zone on cabbage leaves at Stellenbosch in August, 1930.

Septoria cercosporoides and *S. pyricola* have been found on the leaves of *Chrysanthemum leucanthemum* and Kalbas pears, respectively.

Rye leaves were attacked by *Heterosporium secalis* n. sp., which forms elongated, straw-coloured blotches and is characterized by dark brown, simple, slightly flexuose, amphigenous conidiophores, 6 to 8 μ thick and up to 95·5 μ long, forming pulvinate tufts, and acrogenous, fuscous, elongated, minutely echinulate, uni- to biseptate conidia, 6·8 to 9 by 42·5 to 59·5 μ.

Pleospora camelliae n. sp. forms grey of buff-coloured, oval to circular spots with a brown zone on *Camellia japonica* leaves in association with *Macrosporium camelliae.* Its perithecia are black, amphigenous, and measure 259 to 295 by 185 to 222 μ; the asci cylindrical, shortly pedicellate, measuring 102 to 127·5 by 22 to 27 μ, and containing eight 7-septate, distichous, yellowish-brown, oblong, muriform ascospores, 27 to 34 by 10 to 15 μ; numerous hyaline paraphyses are present.

Taxonomic notes are given on a number of other new or recently recorded species.

VERWOERD (L.) & DU PLESSIS (S. J.). **Descriptions of some new species of South African fungi and of species not previously recorded in South Africa—III.**—*S. African Journ. of Sci.*, xxviii, pp. 290–297, 1931.

Among other new species of fungi and fresh records for South Africa [cf. *R.A.M.*, x, p. 408] the following may be mentioned. *Gloeosporium sansevieriae* n. sp. forms buff-coloured spots with a

chocolate-reddish margin on the leaves of *Sansevieria zeylanica*, large parts of which may be destroyed. The acervuli are amphigenous and 266 to 560 by 168 to 280 μ; the thin, needle-shaped conidiophores measure 1·6 μ in diameter and bear ovoid to subcylindrical, hyaline conidia, 11·2 to 20·8 by 4·8 to 6·4 μ.

Peaches at Wynberg (Cape Peninsula) were attacked in October, 1929, by *Phoma persicae* [ibid., iv, p. 618], causing the death of the twigs.

Phyllosticta ficicola and *P. psidii* occurred on the leaves of fig (*Ficus carica*) and guava (*Psidium guajava*), respectively.

Pleospora herbarum, with its conidial stage, *Macrosporium sarcinula* [ibid., x, p. 430] was found on dry stalks of onions killed by *Peronospora schleideni*, and on lucerne stems.

Honeydew melons were attacked by *Pseudoperonospora cubensis*.

The leaves of *Tetragonia expansa* were infected by *Puccinia tetragoniae* (uredospores and teleutospores).

Sphaerulina eucalypti n. sp. is characterized by amphigenous, subcuticular, globose perithecia, 154 to 210 μ in diameter and cylindrical to semi-clavate asci, 28·8 to 38·0 by 6·4 to 11·2 μ, containing eight ellipsoidal, 3- or rarely 4-septate, hyaline ascospores, tapering at both ends, 9·6 to 19·2 by 3·2 to 5·0 μ. It forms irregular, confluent, leaden grey spots with a narrow, raised margin on the leaves of *Eucalyptus* sp. in association with a *Phyllosticta*.

BAKER (C. F.). **Second supplement to the list of the lower fungi of the Philippine Islands. A bibliographic list chronologically arranged, and with localities and hosts.**—*Philipp. Journ. of Sci.*, xlvi, 3, pp. 479–536, 1931.

The present supplement (edited by F. L. Stevens) to the list of lower fungi of the Philippine Islands compiled by C. F. Baker and left by him in manuscript form about 1921, comprises Phycomycetes, rusts, smuts, Ascomycetes, and Fungi Imperfecti additional to those enumerated in Baker's two earlier lists. Literature references (many of which were added by the editor) and synonyms are given in a number of cases.

BURT (E. A.). **Hymenomycetous fungi of Siberia and Eastern Asia—mostly of wood-destroying species.**—*Ann. Missouri Bot. Gard.*, xviii, 3, pp. 469–487, 1931.

The present list of 127 Hymenomycetes—mostly wood-destroying species—from Siberia and Eastern Asia is stated to be based on the examination of some 250 carefully selected specimens. The compilation includes five new species, viz., *Trametes radiata* on *Betula dahurica*, *Hydnum murashkinskyi* on *B. verrucosa*, *H. reflexum* on *B.* sp., *Thelephora tenuis* on sandy ground, and *Coniophora sibirica* on decaying coniferous wood, probably *Pinus sylvestris*, and is thought to be of great interest in extending the westward range of certain species hitherto only known in the United States and the eastern range of many European species. Critical, taxonomic, and geographical notes are given.

SORIANO (S.). **El 'corcovo' y el 'polvillo' del Tabaco en la República Argentina.** [The 'hunchback' and the 'fine dust' of Tobacco in the Argentine Republic.]—*Rev. Fac. Agron. y Vet.*, vii, 2, pp. 371–392, 4 pl., 1931.

The following symptoms have been observed by the writer to be typical of the 'hunchback' ('corcovo') disease of tobacco in the Argentine Republic [*R.A.M.*, i, p. 318; x, p. 562]. The terminal bud is bent over in the form of a crook, the concave region of which often shows necrotic streaks. Characteristic markings develop along the veins of the leaf blades, the interveinal areas of which dry out. Both external and internal necrotic streaks appear on the crook-shaped portion of the terminal bud. The general withering and yellowing of the plant is usually accompanied by decay of the roots, in which nematodes or other worms may be present; no decisive importance, however, is attached to these. The lower leaves of affected plants generally turn yellow and shrivel prematurely. During the season of 1928–9, the incidence of 'corcovo' in the Lerma Valley (province of Salta) was very low (1·3 per cent. in one plantation only), whereas the disease known as 'polvillo' or 'fine dust' (an unsuitable designation in the author's opinion) and mosaic were prevalent, the maximum percentage of the former being 60·4 and of the latter 71·6.

The leaves of plants suffering from 'polvillo' are curled and creased, the midrib showing well-marked necrosis and the lateral veins distinct necrotic lesions. The stems exhibit numerous necrotic streaks both externally and internally. The attack often occurs in the centre of the plant and proceeds in one direction only. There is no bending over of the terminal bud and seldom any rotting of the roots. The lower leaves generally remain healthy until the entire central region of the plant becomes involved when they also shrivel. The tip or upper half of the young leaves very frequently shows yellow spots that develop into necrotic areas, a feature which must be carefully differentiated from a somewhat similar manifestation of mosaic. Black necrotic streaks are almost always present on the exterior of the calyces.

In the writer's opinion, 'corcovo' and 'polvillo' are varying manifestations of a single disease which is provisionally referred to the virus group, comparisons being drawn between these disturbances and tomato streak, ring spot of tobacco, phloem necrosis and net necrosis of potato, mosaic of potato and tobacco, and bunchy top of banana.

The histological study of tobacco stems and leaves suffering from 'polvillo' and 'corcovo' revealed a complete absence of any parasitic organism. A constant feature of the diseased tissues was the presence of islets of dead cells with a dark granular content and devoid of nuclei and protoplasm, united in small groups. Another marked characteristic of the affected plants was the increased size of the intercellular spaces in the necrotic zones. Although the occurrence of cell inclusions (X-bodies) was not actually demonstrated, some of the microscopic preparations contained very regular, fusiform bodies, resembling minute protozoa, the nature of which is not yet clear.

Inoculation experiments in Salta, in which the expressed juice

of diseased plants was inserted through wounds into healthy ones, gave positive results in 23 cases out of 30, three others being doubtful. Some of the plants used as sources of inoculum had typical 'corcovo', other typical 'polvillo', while a few were intermediate. However, when these experiments were repeated at Buenos Aires, none of the inoculated plants contracted 'corcovo' or 'polvillo' symptoms, but one to two months later they developed severe mosaic. Supposing the disturbances under investigation to belong to the virus group, this phenomenon may be the result of a union of two distinct infective principles, of which mosaic would be one. Attempts to transmit the two diseases by means of insects gave negative results. In May, 1930, J. B. Marchionatto inoculated healthy Criollo Salteño, Hickory Pryor, and Hoja Parada tobacco plants with the expressed juice of 'corcovo' individuals, the outcome being positive in the two former varieties. The symptoms developed in 11 days on Criollo Salteño and in 14 on Hickory Pryor. Before unfolding, the leaves presented the typical symptoms of mosaic (green and yellow mottling with pronounced distortion), while at maturity they further showed irregular bulges in the leaf blade and zig-zag necrotic streaks partially delimiting the veins. The tip of the stem was slightly bent and finally growth was arrested; the tissues, especially of the phloem and xylem, became greyish; while the plants remained stunted and failed to flower.

In 1931, Hickory Pryor plants were inoculated with 'polvillo' juice and Criollo Salteño with that of 'corcovo'; in both cases the typical symptoms of mosaic developed on the 13th day after inoculation and persisted until the end of the test.

It would appear from these results that 'corcova' is an infectious disease, the exact relationship of which to 'polvillo' and mosaic requires further investigation along lines which are indicated at some length.

McLarty (H. R.) & Woolliams (G. E.). **Tomato breakdown.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 128–134, 1 fig., 3 graphs, 1931.

A progress report is given of investigations conducted during 1930 into tomato breakdown [*R.A.M.*, ix, p. 18] which in some seasons causes severe losses to growers in British Columbia, and is also representative of a type of disease found on many fruits there.

Three plots A, B, C, which received normal, excess, and deficient supplies of water, respectively (i.e., 11·76, 16·8, and 9·8 acre inches), were planted with tomato plants (Earliana variety) in which the terminal bud had been pinched off and two opposite lateral shoots allowed to develop into the two main stems to provide a treated portion and an untreated control portion on each plant. The treatment given consisted of a series of excessive temperature fluctuations (from an average of 120° F. to between 50° and 60°) over a three or five day period, obtained by placing glass cages over the plants, and the employment of artificial heat or the sun's rays.

The results obtained were as follows: in plot A, 7 out of 53 treated

fruits broke down against 1 in 50 in the untreated; in plot B, the figures were 2 out of 19 and 1 out of 15, respectively; and in plot C, 9 out of 20 and 3 out of 20. All the treated tomatoes showed a decrease in the firmness of the flesh, measured by a pressure tester, in comparison with the controls.

VALLEAU (W. D.) & JOHNSON (E. M.). **The viruses concerned in a natural epiphytotic of streak in Tomatoes.**—*Phytopath.*, xxi, 11, pp. 1087–1089, 1931.

Details are given of a natural epiphytotic of streak and mosaic occurring on tomato plants at the Kentucky Agricultural Experiment Station in October, 1930. The first symptoms of streak were observed when the plants were about 3 ft. in height, and a month later 22 out of 51 plants on the same bench were affected by streak and 12 by mosaic. The latter disease was also present in an adjoining greenhouse, where streak, however, was not found.

Inoculations were made on 59 Turkish tobacco plants from each of the 51 plants in the first house and from selected individuals in the second. Following infection, the tobacco plants could be placed in four groups, viz., healthy 15, infected with the healthy potato virus 3, with tobacco mosaic 18, and the same with necrosis 23 [*R.A.M.*, x, p. 409]. The healthy potato virus [ibid., xi, p. 132] was obtained from plants with a very distinct mottle, typical of the symptoms induced by the inoculation of tomatoes with this virus from potatoes. In tobacco the disease was characterized by small, concentric rings on rubbed leaves and necrotic ring and line patterns and watered silk chlorotic patterns in the newer leaves. It was found only in the first house. The tobacco mosaic virus was obtained from tomato plants with a rather severe mosaic, but no evidence of streak on the stalk or petioles and no leaf necrosis. The necrotic mosaic was derived from plants showing only the symptoms of the presence of tobacco mosaic or mosaic with some leaf necrosis, and from rapidly growing ones with stalk and petiole streak and leaf necrosis. On the rubbed leaves of tobacco plants inoculated with this virus necrotic spots developed in a few days and gradually increased until many of the leaves were killed. The symptoms of typical severe tobacco mosaic ultimately developed in the growing point, accompanied by necrotic dots or small rings, as well as by stunting. Mosaic, on transference to tomatoes, produced only mosaic.

It was shown in the following ways that streak in tomatoes and necrotic mosaic in tobacco are the result of a mixture of tobacco mosaic and the healthy potato virus. 1. A mixture of the two viruses produced symptoms in tobacco and tomato corresponding with those produced by the virus complex from streak tomatoes. 2. Symptoms of the healthy potato virus were clearly recognizable in tobacco plants affected with the streak virus complex. 3. Transfers of the streak virus complex to virus-free seedling potatoes produced stem and leaf streak typical of that produced by tobacco mosaic alone, but transfers to tobacco from potato leaves formed after inoculation resulted in only the concentric rings and

other symptoms characteristic of the healthy potato virus. 4. Transfers of the streak virus complex to *Datura stramonium* induced a mild mottling of the new leaves, and transfers from these to tobacco produced the disease caused by the healthy potato virus. The healthy potato virus was thus separated from the mixture and obtained pure in tobacco. The evidence seems to indicate that these two viruses only were concerned in the natural epiphytotic.

It is thought that the tobacco virus was spread from the first to the second house on the hands of workers, the potato virus apparently not being transmitted in this way.

Kartoffel-Ein- und Durchfuhrbestimmungen. Jugoslawien (Aenderung). [Potato import and transit regulations. Jugo-Slavia (amendment).]—*Oesterr. Zeitschr. für Kartoffelbau, 1931,* 4, pp. 88–89, 1931.

Apart from the usual regulations against wart disease [*Synchytrium endobioticum*: *R.A.M.*, ix, p. 816] in Jugo-Slavia, potatoes from Austria may not be imported on account of the sporadic distribution of the disease in that country, but their transit is permitted under stringent precautions.

Ministério da Agricultura. Campanha da produção agricola. [Ministry of Agriculture. Campaign of agricultural production.]—*Diário do Govêrno*, Sér. i, 268, pp. 2545–2546, 1931.

Decree No. 20:535 (6th November, 1931) requires that all consignments of potatoes imported into Portugal shall be accompanied by a duly authenticated certificate guaranteeing absence of wart disease (*Synchytrium endobioticum*) from their place of cultivation and a surrounding radius of 5 km. The importation of potatoes from America is prohibited. Inspectors are authorized to destroy (or return to the sender at the importer's expense) any potato consignments showing the slightest trace of wart disease or over 5 per cent. infection by *Phytophthora infestans*, *Spongospora subterranea*, *Actinomyces scabies*, *Fusarium* spp., and bacteria.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* xi, 11, pp. 95–96, 1931.

Saxon Free State. An Order of the Saxon Ministry of Economic Affairs, dated 14th February, 1931, establishes the lines on which the campaign against the elm disease [*Graphium ulmi*] should be conducted [*R.A.M.*, xi, p. 208], while a further Order of 7th October provides that uniformity with the methods employed for this purpose in Prussia shall be secured.

Colombia. A Decree of 1st July, 1931, requires that persons proposing to import plants or parts thereof into Colombia from foreign countries must obtain a special permit from the Ministry of Agriculture. All such consignments must be accompanied by an official certificate from the plant protection service of the exporting country guaranteeing freedom from injurious plant pests and diseases.